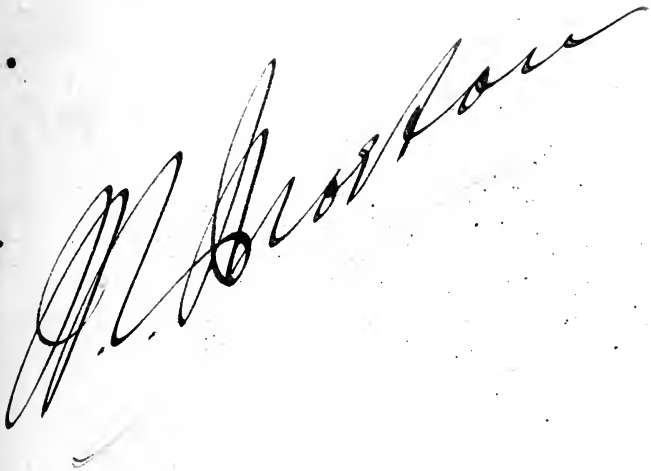
Modern Sporting Gunnery

HENRY SHARP



MODERN SPORTING GUNNERY

A TYPE OF MODERN ENGLISH GUN ENGRAVING.

Frontispiece.

Modern Sporting Gunnery

A MANUAL OF PRACTICAL INFORMATION FOR SHOOTERS OF TO-DAY

BY

HENRY SHARP

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'PRACTICAL WILDFOWLING,' 'THE GUN: AFIELD AND AFLOAT,' ETC.

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PREFACE

THE idea of this book has been in my mind for some seven or eight years at least. The first half of this period produced nothing more than a general scheme of arrangement and a few fitful notes; but all the time the conviction grew upon me that my idea was incapable of adequate realization unless I could secure the aid and advice of the practical gunmaker.

I have had myself a shooting experience of some twenty-five years or more, extending from my early boyhood, and from the layman's standpoint think I have a claim to some knowledge of guns and ammunition; but I wished to discuss the construction and the mechanical functions, the performances and uses of both shot-gun and rifle, after an accurate and thorough fashion, with the object of proving helpful to shooters, and always, let me add, without asking them to traverse the toilsome region of the severely mathematical or technical.

It was, therefore, fortunate that I was able to obtain *entrée* to gun-works owned by a firm of world-wide reputation; and I do not know that, for my purpose, it would have been possible to find any one firm so desirable, and with such all-round achievements, as Messrs. Westley Richards. To them I am indebted for complete and unrestricted accessibility to their factory, as also for a liberal draft upon their archives, representing the stored-up experience and knowledge gained throughout all the notable changes of a century's gunmaking.

The British gun industry stands unrivalled amongst its competitors in any country abroad; and unquestionably there are in London, Edinburgh, Birmingham, and the provinces, not a few gunmakers whose manufactures exhibit the highest qualities of finish and mechanical efficiency—which other sportsmen besides myself are pleased to acknowledge. But apart from the consideration of manufacturing skill, in the endeavour to trace the evolution of the sporting firearm, mainly and in detail, I think it is impossible to turn to any other firm than that named, to whose credit stands so lengthy a sequence of important inventions which are largely and uniquely identified with the history and successful development of the modern gun, rifle, and cartridge.

I do not pretend that the privilege of a roving commission through a gun factory, though extending over a couple of years, suffices to stamp me as a gunmaker. I do think, however, that it has enabled me to acquire a degree of knowledge which permits me to offer useful advice to my fellow-sportsmen ; and I, at least, can estimate the help it has been to me in the attempt to carry out my original idea.

To the Managing Director of the Westley Richards Company —Mr. Leslie B. Taylor—I am especially indebted for having enabled me to acquire much of this purely technical information concerning guns, rifles, and allied matters. For a quarter of a century Mr. Leslie Taylor has assisted in guiding the destinies of his firm ; and, being yet in the early prime of life, he has, I trust, many years of usefulness before him in which to add to the obligations he has conferred upon so many sportsmen. His researches in the advanced path of scientific gunnery ; his several patented inventions, such as the detachable gun-lock, capped expanding bullet, the pivot wind-gauge sight, etc., are proof, I think, that he has inherited the traditional progressive spirit which animated the founders and the former managers of his business.

We have it on authority that the cartridge plays a more important *rôle* even than the weapon which fires it. Whether or not we accept this dictum, I have sufficiently recognized its indubitable claim to fill a foremost place in this work by dwelling at length upon the various aspects of the question of shot-gun loads as well as upon sporting rifle ammunition.

Having written much in the past with regard to the rearing, the habits, and the preservation of game, furred and feathered, I now treat the subject of game shooting principally from the standpoint of the practical sportsman who has himself constantly tested and approved in the field the killing qualities of the various bores and loads recommended.

Although shooting is perhaps generally regarded as man's monopoly, this book includes advice to the ever-increasing sisterhood of sportswomen, and my acknowledgments are gratefully made to her Grace the Duchess of Bedford for her kind and very valuable assistance on their behalf. Her Grace's experience and skill enable her to speak with authority; and her delightfully instructive contribution, given in Chapter XVIII, is, I believe, the first of its kind written by a sportswoman for sportswomen. My own obligation, as well as my readers', is deepened by the inclusion of portraits of her Grace, showing correct attitudes for carrying and handling the gun in the field.

The introduction of the try-gun and the shooting-ground as essential parts of the gunmaker's business has directed attention to the subject of gun-fitting, which is herein dealt with for the first time on exhaustive and practical lines.

In the Retrospect we have Bishop Latimer's testimony that four hundred years ago it was regarded as a parental duty to train children in the art of shooting. The revival of this form of practical patriotism, due to the weighty utterances of the late Marquis of Salisbury, is now being prosecuted with vigour by Earl Roberts and other personages of authority. It may therefore be considered not inopportune that the subject of miniature rifles, which so closely concerns the training of civilian marksmen, is fully discussed; and, I trust, in a spirit which will help to turn all the forces of this new enthusiasm to the most advantageous account, for the better protection of British hearth and home within and beyond the seas.

Many of the illustrations throughout this book are photographic reproductions showing the various component and mechanical parts of sporting arms and their adjuncts. Those delineating game birds and animals have, I imagine, an interest somewhat unusual; as, for the most part, they are facsimiles of the gun-engraver's actual "touches"; albeit, I admit, they make no pretensions to inform the naturalist.

HENRY SHARP.

FRISKNEY,
September 1906.

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CHAPTER I

A RETROSPECT

FROM times far remote, when ancient Britons killed deer, wild boar, or wolf with flint-headed arrow and spear, in fact, ever since the country had a history, Great Britain has been inhabited by a race of sportsmen. English history and legend bristle with fact, incident, and anecdote, which go to prove this statement. There is King William Rufus, for instance, who was slain by an arrow whilst hunting in the New Forest. Robin Hood also, and his band of rollicking fellows, who, if report says true, had a right merry time of it amongst the red-deer or fallow-deer in Sherwood Forest—for forests were plenty and deer numerous in England in those days. And so strong was the national love for sport, for gamesomeness, and for the outdoor life, that it raised these poachers (for that, in truth, I fear the latter were) into national heroes. And I might go on multiplying instances indefinitely.

Now, perhaps, in no phase of sport have the English, from times immemorial, shown greater aptitude and excellence than in that of marksmanship, and this, too, in the arena of war as well as in that of the chase. *Semper eadem!* Both long-bow and cross-bow had a lengthy period of service as weapons of offence or defence, in war and the chase. In Plantagenet and Tudor times, shooting with bow and arrow reached the highest pitch of perfection, and the skill displayed by English bowmen was widely gossiped abroad; nor is this so remarkable, seeing that archery practice was then compulsory upon all able-bodied men under sixty years of age—by the way, a far higher limit in the period of service than is now reached by our soldiery. As a consequence, the man who could not then perform creditably with the long-bow at distances between 300 and 400 yards, was not held in much account as a marksman. In those days, even as in ours, there were good clerics who could shoot without shaming themselves, as Bishop Latimer in one of his sermons quaintly testified, for said he—

"In my time my poor father was as diligent to teach me to shoot as to learn me any other thing; and so I think other men did with their children. He taught me how to draw, how to lay my body in my bow, and not to draw with strength of arms as others did."

But leaving those ancient weapons, which, although excellent enough in their day, have now only an historical interest for us, we come down to the first firearm—herald of so mighty a following. The precise date of the invention of gunpowder, and of the change from the mechanical to the chemical weapon, is scarcely traceable amid the mists of obscurity. Indeed, it would seem that the inventive genius of great minds in different countries was more or less simultaneously at work upon the development of gunpowder as an agent for discharging a missile, and of the gun as the means for directing the flight of that missile. History discloses the fact that an explosive compound of some kind was known in the time of Moses. Such explosive compound would appear to have been at first employed in the way of a pyrotechnic demonstration designed to strike terror into the hearts of a foe. This much in the spirit of those Chinese, who, even at this day, display upon their banners dragons of the bogey order, or other ferocious-looking creatures, to the accompaniment of a persistent din and clashing of brazen instruments, all with the object of creating fear.

The precursor of undreamt-of possibilities as it has proved to be, there is still small wonder that the firearm found but little favour in the earlier period of its introduction. It then was so excessively clumsy in construction, so generally unwieldy, and so uncertain of action, that for some considerable time it proved but a revolutionary novelty, a sort of show puppet that as an engine of destruction was useless to the practical man.

In the earliest examples, the ignition had to be effected by hand by means of a loose match or fuse, and one may well believe that the process of firing was exceeding slow and deliberate; in fact, two persons were frequently required, one to aim and the other to discharge the piece. So matters progressed slowly with the firearm; until mechanical ingenuity at length succeeded in devising a means for doing away with these laborious and leisurely two-men methods, and sometime about the second decade of the sixteenth century the arquebus, or matchlock, a Spanish invention, was introduced. The arquebus marked a great advance upon all the existing crude systems of ignition; and, indeed, in the serpentine of this weapon, the limb which held and carried the match to the touch-hole of the barrel, there first appears in embryonic form the hammer of more modern firearms. Arquebus and musket—both names being given to the hand-guns of the sixteenth century—appear to have been practically synonymous terms, save for the fact that the musket was the larger and heavier weapon.

Perhaps I may not be strictly fair in giving priority to the arquebus, for according to some authorities the wheel-lock, a better arm, was contemporaneous, having been invented at Nuremberg a little before 1515. But historians are somewhat at variance relative to the question of dates, and there I will leave the matter, as it is no part of the scheme of the present work to decide such points.

The flint-lock, a Spanish invention, dating from 1580, began to prevail about 1630. For the match arrangement of the arquebus, this arm substituted a method of igniting the powder charge by means of sparks created by the striking of flint against steel. In the country of its origin it was originally styled "Lock à la Miquelet," from the fact that it was used by the Miquelitos, bandit or partisan soldiers of the north of Spain. It was also styled "Snaphaunce," from the fancied resemblance of the flint hammer to the head of a pecking fowl.

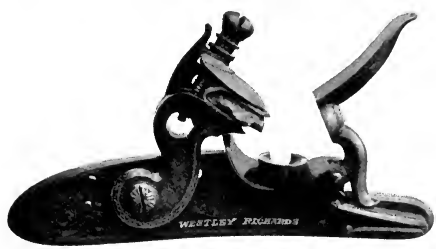
During the Stuart *régime* marked improvements were made in the construction of guns in this country; it was in those times that the nucleus of the modern double-barrelled shot-gun was evolved. It may surprise some sportsmen of the present day to learn that so far back as the reign of Charles the Second the first patent granted in this country for breechloading guns was taken out by the Earl of Worcester, a forbear of the present Duke of Beaufort.

In the early Georgian period, the flintlock firearm had come into general use, and this more certain form of ignition assisted greatly towards the extended employment of the gun for purposes of sport. Naturally, the sporting critic of the period was not slow to take note of the improvements going on around him, and occasionally his pronouncements are so quaint as to merit repetition; some undoubtedly were much to the point, and helped not a little to advance the science of gunnery.

Towards the end of the eighteenth century, and, to be precise, in 1782, "that most able Park and Gamekeeper and famous Marksman, Mr. Lemon," gave to the world *A Dissertation on the Errors of Marksmen and Gunmakers*, and a *Tract on the Art of Shooting Flying*. His little tract is really delightful reading. It is quite refreshing in these humdrum days of ours to be told of "the igniferous stroke of the lock and appulse of the shot to the object," of the "altitudinal celerity of the bird," of "birds ripe in plumosity," or "that have arrived at the zenith of their strength;" or again, of "flaccid and immature birds," whose "celerity is torpid." Despite this fanciful grandiloquence, there was a good deal of sound sense in the pamphlet, and it is not improbable that this writer exercised some influence in the direction of improved methods of gun construction. Certainly Mr. Lemon condemned most strongly the cumbrous weapons then in use, and recommended shorter barrels, straighter stocks, and smaller sights. He ridiculed the "protuberant muzzle," as well as the "height of that mass called a sight;" which, by the way, he characterized as "the nominal directory on the point of the gun."

So we get to the closing decade of the eighteenth century, when there came upon the scene one Joseph Manton, gunmaker, of London town, who earned celebrity more for the sterling quality of his work and for the soundness of his methods in the construction of the fowling-piece than for his inventive genius. He spent a fortune on litigation concerning his inventions, but it cannot be conceded that these inventions were of practical value; indeed, in some cases, they were trivial and unimportant. It was not as an inventor that he shone, but as a sound and artistic gunmaker, and above all as an organizer, which is testified to that he rallied round him a "fine army of workmen," as Colonel Hawker has it, many of these workmen subsequently earning for themselves fame as master gunmakers. He did much towards shaping the shot-gun upon lines which accorded more closely with the tastes and requirements of the shooter; thus the name "Joe Manton" became a household word with sportsmen during the early years of the nineteenth century, and his fame as a gunmaker lived long after him. Joe Manton's brother, also, was celebrated as a maker of good sound guns, and this brother, John Manton, in 1797,

Before Firing.



After Firing.

FIG. 1.—WESTLEY RICHARDS FLINT-LOCK.

patented a method for discharging both locks of a double-barrelled gun by means of one trigger. But even in this idea, which, as we know, has only quite recently entered the domains of practical gunnery, John Manton was forestalled by certain of his contemporaries, for in 1789 John Templeman, and in 1794 Thomas Sykes, had taken out patents having the same object in view.

The supersession of the flint ignition by the percussion-cap system, and the final triumph of the breechloader over the muzzle-loader, are well-worn themes that need not be descanted upon at any great length in a work dealing with modern gunnery. In 1807, the Rev. Alexander John Forsyth, LL.D., a Scottish clergyman—the Cloth again!—invented a new form of ignition, the percussion system, a modification of which is in use at the present time. As in the case of nearly every invention of primary importance connected with sporting firearms ultimately destined for universal adoption, the detonating principle of igniting the propellant charge took several years to thoroughly establish itself, so tenaciously did sportsmen cling to their old favourite, the cumbrous flint-and-steel method. It is, doubtless, the old story: frequently so undeveloped are the earliest applications of some great new principle, that in actual practice they may prove inferior to the developed applications of an altogether poorer system. Anyhow, the detonating plan took fifteen years or more to root itself on the sunny side of popular opinion. The crude methods at first in vogue for utilizing the detonating powder were greatly responsible for its tardy adoption.

In 1821, William Westley Richards, originator of the well-known Westley Richards firm, helped to popularize the detonating principle, by his invention of a percussion gun. This, with his subsequent invention, 1833, earned much favour amongst the foremost sportsmen of the day, because it did its work well, and was not only ingeniously adapted for use with several of the detonating primers employed at the time, but also for use with a special form of primer devised by Westley Richards himself. Colonel Hawker remarked of Westley Richards' steel primer, here illustrated: "Of all the inventions (for common-sized guns) that have been brought out since the flourishing days of Joseph, this, in my humble opinion, is the best. I have tried it repeatedly, and never yet knew it to fail; and my son shot with it for a whole season, and never had one miss-fire. The next season he accompanied me to the coast, where we had heavy seas and much wet weather; and while my copper caps were missing about two shots out of ten, his primer never failed once."

So by degrees, and by inventions such as this, the many and several advantages of the percussion, as against the flint form of ignition, were brought home to sportsmen. Once it was realized that with percussion guns the ignition was much more certain and rapid; that these arms effected an undoubted and distinct economy of propulsive force, by reason of the greatly minimized escape of powder gas through the touch-hole, and, finally, that

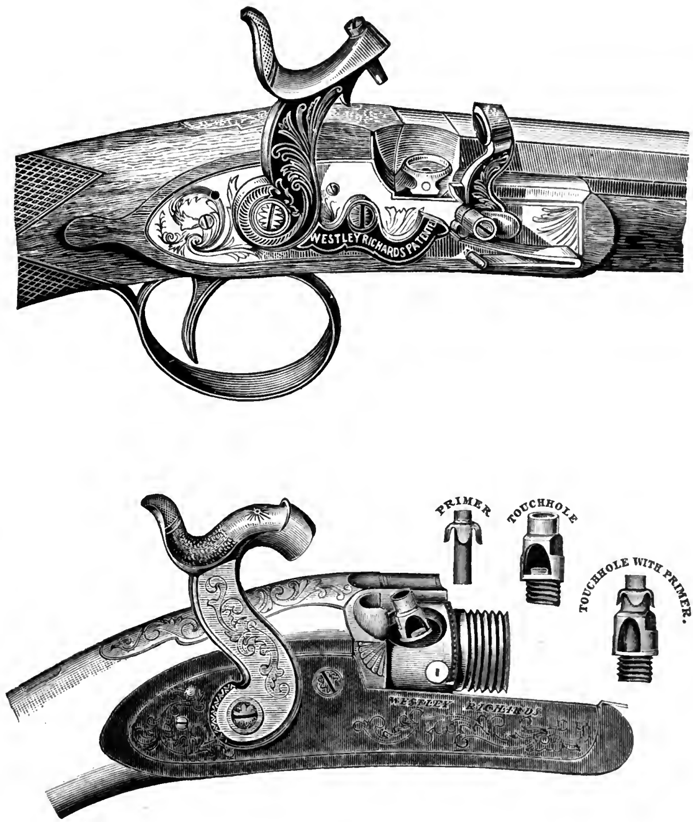


Fig. 2.—Westley Richards Detonating Gun.

with the copper cap miss-fires were infinitely less frequent, the triumph of the new gun was established.

Although the name of Lefaucheux, a gunmaker of Paris, has become inseparably connected with the application of the breech-loading principle to the shoulder firearm—many people regarding him as the originator of the idea—it is doubtless the fact that in the first instance, at all events, his were but modifications of the inventions of one Jean Samuel Pauly, of Little Charlotte Street, in the parish of St. George, Hanover Square, and county of Middlesex, engineer, who in the years 1814 and 1816 took out patents for breechloaders with fixed breech and movable barrels.

As a matter of fact, some twenty years or so had elapsed before M. Lefaucheux stepped upon the stage with a new mechanism, which he at first designated as "à la Pauly," but after a time this acknowledgment was dropped and Lefaucheux claimed full and undivided credit for his work. Nevertheless, the *Field* newspaper, amongst other eminent authorities, considers Pauly's invention to have been the prototype of the form of breechloaders at present almost universally adopted for sporting purposes.

However this may be, full credit of necessity must be accorded Lefaucheux in that his was the first practical idea of a breech-loading gun on workable lines. It was, as we well know, on the drop-down principle; that is to say, the barrels, partly revolving upon their hinge-pin, on being unbolted by the hand lever, dropped their muzzles through force of gravity, thus raising their breech ends into a position convenient for the extraction of spent shells and for the insertion of fresh cartridges. In the Lefaucheux gun, the opening lever was placed forward of the trigger-guard, and rested underneath the fore-end of the stock. This action having but a single grip was essentially weak. This defect was shortly afterwards remedied by an English gunmaker, who made the breech fastening a double-grip, on the principle of a screw, thus securing the effect of binding down the barrels upon the action body in addition to holding their breech ends in position against the standing breech. In this method, the first under-lever double-grip action, the lever effecting the movement was placed underneath the trigger-guard—a much neater, handier, and altogether more effective arrangement than that of Lefaucheux.

This retrospective chapter, like the book which follows, deals only with practical inventions which have become part of the sportsman's equipment, and which were, or are, in general use throughout the civilized world. But there were doubtless several still-born devices, in the form of hammerless actions, single-trigger arrangements for double guns, and so forth, that came before their time, and of which any mention is seldom to be found save by the ardent student of research.

However meritorious such ideas may have been, they are not, in my opinion, entitled to detract from the gratitude we owe to those gunmakers and others who have made practical successes of their several improvements.

For instance, among these inventors of "unfulfilled renown" may be mentioned one M. Pottet, of Paris, who actually produced a central-fire hammerless gun in 1833; the locks were self-cocking, and had a top safety slide bolting the sears. This gun, however, had no extractors, a ramrod being supplied to extract whatever form of cartridge was then employed; it was opened by a half-turn of the stock and pulling forward the barrels.

Other inventions might be instanced, but having little practical value, it will not serve any useful purpose to follow such by-ways and side-alleys of progress as the Lefaucheux gun, the Prussian needle-gun, or Lancaster's four-holed base-fire cartridge, etc., as it cannot in any way be discovered that these premature novelties influenced those now recognized as responsible for the true development of the modern breechloader. The breechloading and revolver system were applied even to the earliest arms. In early times ordnance, we know, was made on the breechloading principle, and the matchlock appeared about 1550 as a revolver, but it would be manifestly unfair, and, indeed, far from the truth, to say that those who made the breechloading system a practical reality, and established the success of the modern revolver, were imitators of ancient systems. To bring the subject down to more modern times, we should have to say that the immature and clumsy single trigger introduced by John Manton was the forerunner of the highly-developed mechanical single-trigger arrangements which appear on some modern guns. And we know it was not.

In 1858, Westley Richards invented and patented the top lever, and this he further improved in 1862. His invention not only substituted a top lever for the under lever, but it included the extension rib in various forms, and a bolt engaging therewith, which survives to the present day as the strongest and most secure form of breech fastening (*vide* Chapter II).

Great as were the foregoing achievements, the introduction of a reliable cartridge, containing both powder and shot and all the essentials for the due ignition of the former, and the effective propulsion of the latter, was little less noteworthy. This necessary accompaniment of the breechloading system, which at one stroke greatly simplified matters for the sportsman, for it removed all necessity for nipples on the gun, or for loose percussion-caps and wadding, and dispensed entirely with the powder-flask, shot-belt, ramrod, and other encumbrances; the whole charge by the new device being contained in one receptacle—the cartridge-case.

In due time the awkward pin-fire cartridge of Lefaucheux was superseded by the central-fire system invented, it is said, by Pottet, and introduced here by Daw in 1861. This method of ignition is now of universal application, and just as the experience of nearly half-a-century, derived from all conditions of sport, has been unable to suggest improvement upon the excellent mechanical arrangement of the Westley Richards top-lever system as opposed to the under lever, so does experience retain the Daw central-fire as still being the best means of cartridge ignition.

Following upon this came the rebounding lock, invented by Bardell and Powell in 1866. An improved system of rebounding lock was patented by Stanton, of Wolverhampton, in 1869, and to this day a good number of guns are made upon this principle, especially for use in Eastern Europe, in high-grade arms, as also for India and Africa in guns of lower grade. It was no little achievement for this invention to have secured an increased degree of safety by abolishing the half-cock arrangement of the older system—in which the safety position of the hammer could only be effected by a manual operation—and thereby to have eliminated the personal element, substituting for it an automatic mechanical device, which saved the sportsman unnecessary thought and care, and increased the speed and efficiency of the firearm. This development completed the era of the gun with external hammers, and the next stage in the progress of the gunmaker's ingenuity is the production of a gun from which the external hammers disappear.

Many of us now living can remember the advent of this remarkable change in gun construction, a change which effected a radical alteration in the appearance of the drop-down breech-loading arm, and marked an epoch in the evolution of the sporting gun and rifle as precisely as did the introduction of the breech-loader itself. I refer to the system known as the Anson and Deeley barrel-cocking hammerless action, invented by members of the firm of Westley Richards in 1875. Anson was a very capable mechanic and inventor in the employ of Westley Richards & Co. as foreman; he died years ago. Mr. Deeley, the co-patentee, whose labours in connection with gunnery are well known, is the veteran chairman of the Westley Richards Co., and is still hale and hearty at the ripe age of 81 years.

It is true there had been a few attempts, more or less unsuccessful, in which the top or under lever was utilized to effect the cocking of the arm; but heretofore nobody had succeeded in making a gun-action with so few parts and of such great strength, all contained within the breech-action body, and mechanically arranged to automatically cock the tumblers by the fall of the barrels.

Undoubtedly, the Anson and Deeley is the parent of most of the hammerless systems now applied to drop-down arms; it has been manufactured by far on the largest scale, and at the present time, thirty years after its introduction, it is still in more exclusive use than any other type of hammerless action. This remarkable invention actually reduced the number of parts in the gun-lock by no less than fifteen, with the result that each remaining limb could be made much broader and stronger within the same compass. The striker and tumbler, being comprised in one limb, operate directly upon the cartridge without the need of a separate striker. I think it is not too much to say that this invention completely revolutionized the breechloader, and amongst the benefits it conferred I will enumerate these: It saved the sportsman thought and trouble; increased the speed of loading and firing; and, by eliminating the personal element in the cocking and lowering of the hammers by hand, removed one of the principal causes of accident inseparable from the gun with external hammers.

Thus was shooting rendered safer, easier, quicker, and more effective; and thus the Anson and Deeley was firmly established as the most successful and most deservedly popular hammerless action. Some hundreds of thousands of guns have already been made upon this system, both here and abroad, and it is considered by both experts and sportsmen to have reached the *ultima thule* of mechanical efficiency under existing conditions.

The side-lock hammerless gun is an off-shoot of the Anson and Deeley barrel-cocking hammerless method. Its external appearance is doubtless pleasing, but this arrangement has been purchased at the sacrifice of the perfect simplicity of the original Anson and Deeley gun. The structural complications and defects present in the side-lock hammerless gun will be dealt with in the chapter relating to gun construction. Suffice it to say here that certain forms of side-lock hammerless guns require greater manual force for their manipulation, some opening with considerable ease and closing with objectionable difficulty; in this respect differing from the true barrel cocker, in which there is a more equal distribution of the force required for opening and for closing the breech.

There are, of course, various minor improvements connected with the evolution of the sporting firearm, respecting which it will not be necessary to give details in this present chapter; but amongst those of this character which are more or less constantly employed at the present day, there is one that may receive passing mention. I refer to the fore-end fastening, in which connection has been applied a readier means for taking the gun apart. The fore-end, in other words the part underneath the gun-barrel grasped by the left hand when shooting, was formerly secured by a sliding cross-bolt; this was liable to become jammed through rust or dirt, and in such case the detachment of the fore-end frequently became a source of irritation to the gunner. The soundest mechanical form of fastening, the Deeley-Edge lever fore-end fastener, obviates this difficulty, and, moreover, mechanically assists towards the removal of the fore-end by means of its catch, which, on being released, pushes the fore-end away from the barrel, thereby saving the sportsman a manual operation. I expect I am not the only gunner who, wearied by an arduous day's sport, has occasionally been grateful for this simple device, by means of which guns may be taken apart for cleaning and packing away in the gun-case with the minimum expenditure of time and trouble.

The lay mind might have been excused the thought that, with the inventions and improvements already enumerated, the limit to the further evolution of the gun had been fixed, and that both sportsman and gunmaker would here rest content. Nothing, however, I am glad to say, appears to quell the activity, mental or physical, of the British gunmaker. True to his past, he evermore seeks fresh fields, and, with new contrivances, would seek to overthrow all difficulties in connection with the inanimate arm.

The barrel-cocking hammerless gun, the Anson-Deeley of 1875, seemed so incapable of improvement that none was called for or suggested by its many users from the date of its appearance down to the year 1897. It speaks volumes for its efficiency and satisfactory behaviour that it took twenty-two years for even the progressive spirit of the times to effect an improvement. However, by the principle of its construction, the locks could not be stripped for cleaning or repair without removing the stock and other parts, an operation almost needing the exercise of skilled knowledge, and certainly one requiring the aid of special tools. This, perhaps, was not felt as much of a drawback by the home sportsman, who had within easy reach his own gunmaker to fall back upon in case of need. But in certain branches of sport, both here and abroad, where it might take days, or even weeks, to communicate with a gunsmith, the sportsman's inability to strip the lock constituted an objection, and to meet the difficulty, mechanical ingenuity was employed to devise a means by which the Anson and Deeley hammerless locks could be detached from the gun in a simple manner.

In 1897, the hand-detachable system, which effectively secured this end, was invented and patented by Westley Richards'. The same limbs contained in the original hammerless lock were employed, and these were fitted upon a separate plate for insertion within the body of the gun action. The cover-plate of the body which secures them in position was made with an ingenious catch, which could be removed and attached instantly by hand and without any tools whatever.

This briefly constitutes the mechanical arrangement of this improvement, which will be found fully described and illustrated in Chapter II. This system of hand-detachable locks dispenses with all the trouble and special knowledge required for the detachment of the gun-lock as it existed under the old method. By this means the operation of taking apart and putting together the lock mechanism, which formerly occupied a skilled workman for some thirty minutes or so, can, with this new system of hand-detachable lockwork, be performed by a mere novice in ten seconds.

This important improvement, so especially valuable, as I have said, to the sportsman when abroad and far removed from the locality of the gun-shop, has proved so thoroughly efficient that sportsmen at home also have shown themselves eager to possess a gun which allows them to thoroughly clean and overlook it when necessary; or, if needful, to send a damaged lock away by post for repair or adjustment, without the trouble and inconvenience of parting with the whole gun.

Incidentally, this system affords another great advantage, conferring an almost inestimable boon upon the shooter in far-off lands. For a moderate outlay duplicate locks, that may be easily interchanged, can be fitted to any gun or rifle. Thus, in the case of possible breakage of any limb, instead of the sportsman having his trip spoiled, he can instantly substitute one of the duplicate interchangeable locks, a fact which renders him all the more confident when embarking upon his expedition.

Beyond the advantages of the easy means thus afforded for cleaning and preventing the accumulation of rust, even in the wettest weather, which appeal so forcibly to the home shooter, there is a further one which commends itself to the notice of the practical gunner, *i. e.* that by this means he has at once readily to hand the simplest and most effective means for preventing that great source of annoyance, namely, meddlesome fingers. Under this system the sportsman can with little trouble put the locks in his pocket, and thus secure his gun from all tampering curiosity and possible use, just as well as if he were to lock it in a safe. This advantage has been to the full appreciated by English sportsmen, who, when shooting in far-off lands, have to employ native servants.

The ejector mechanism advanced the gun another stage. This also is an English invention, which adds to the convenience of the sportsman by automatically expelling from the gun the fired cases, thus doing away with hand extraction. By the use of this ejecting mechanism, the pleasure of shooting is considerably enhanced, and the speed of loading is so much increased that this addition to the gun has undoubtedly been the means of making one ejector gun equal to two of the older type.

The ingenuity of this mechanism also embraced the means of selecting the cartridge to be ejected, *i.e.* it is only the spent cartridge which is automatically expelled from the gun, the live cartridge remains within the gun until fired; while, if two cartridges are fired, both are ejected. It is therefore not surprising that this invention has become the vogue. Upwards of 100,000 guns fitted with this system have been made since its introduction in 1884. Needless to say, full advantage of its merits has been taken by Belgian and other makers abroad, who largely apply this ejecting mechanism to their productions, and, if their output were included, the total above mentioned would be considerably augmented. Probably 90 per cent. of the guns made in America are non-ejecting; and, while the American nation is supposed to be very progressive, yet so far as concerns the sporting gun trade and its developments, it is most conservative and slow. So large is the volume of their internal trade, so secure are they behind their formidable tariff wall, and in such favourable condition are the markets of the world for receiving their superfluous products, that American gunmakers have been able to thrive well without extensively adopting the ejecting mechanism.

It is only now since this patent has expired, that they are beginning to generally apply this system to their weapons. By means of the important inventions of the past century, British supremacy in the gunmaking industry is well established, whilst other nations lag far behind. But this indication of the progressive spirit obtaining in our gun trade does not rest here, as subsequent inventions place British products at least fifteen years ahead of any other country.

We all of us use the phrase, "the march of events," and although the expression conveys a sense of speed, the progress made may be either quick or slow within the movement implied. Nevertheless, it implies, as it should, the steady plodding toil of human endeavour. As will be gathered from previous statements, it is now thirty years since the first barrel-cocking hammerless gun was invented. Also, it is twenty-one years since the first successful ejecting mechanism was applied to the gun. Now few, if any, sportsmen of this country would select a gun which did not possess the advantages these inventions afford—and the same may be said, but not in like degree, of the sportsmen in France, Germany, and Belgium. Prior to their introduction many attempts had been made to apply these principles to the gun.

Development was slow, if persistent; events in the march of progress in scientific gunnery were only marked out from others when perfected and crowned with success. Some ten years have elapsed since a further development of useful mechanism was applied to the gun, mainly in conjunction with the two far-reaching revolutionary systems mentioned. I refer to the single trigger used for firing both barrels of a double gun.

The idea of a single trigger, as remarked in a foregoing paragraph, had its origin towards the close of the eighteenth century, but this need not now concern us, because it was chiefly applied to muzzle-loading pistols, and had but a brief existence. In the year 1882, it was taken up by a Birmingham firm of gunmakers, who failed to make it a success upon breechloading weapons, partly because the idea was not completely developed, and partly, no doubt, because the sportsman was not then prepared for such an innovation.

This new departure, although recognized as of considerable importance, did not excite such keen interest as previous inventions alluded to; but it marked, though faintly, an epoch from which will date that event known to futurity as the rise of the single trigger.

Since then, interest in the system of single-trigger mechanism has spread amongst the gunmaking world, as any one who has consulted the Patent Office records will know. Few of the patents deposited could pretend to the same degree of excellence as the one which first achieved success, the three-pull system.

But even the latter failed to convince the sporting world of the completeness of its merits. Indeed, the average sportsman was so far from convinced that only a very small percentage of high-class guns, built during the first eight years of the movement, were fitted with a single trigger of whatever invention. This reluctance to adopt the novelty was doubtless increased by the vagaries of the mechanism itself. It brought a new problem into the sportsman's experience; it had an unfortunate habit of occasionally discharging both barrels simultaneously.

Such occurrence, in a gun having two triggers, was rare, but whenever it did occur the cause was easily diagnosed and removed. Not so with the single trigger, because this symptom was fitful, and was developed only with certain sportsmen, consequent upon some personal idiosyncrasy in handling and firing off the gun. This defective behaviour, with its unpleasant results, ruined the sportsman's belief in it, and prejudice was thereby created in the minds of men against the principle itself, even when the fault was remedied.

Added to this, the original system, and its numerous rivals which followed on the same lines, although obtaining the same results by different contrivances, perplexed the sportsman on account of the somewhat eccentric movement of the trigger when snapped off without a cartridge in the barrel. In such event three distinct pulls were needed to let off the two barrels. With his two-trigger gun only two were necessary, and the average sportsman, who naturally trusts to the maker in all that concerns the mechanism of his gun, was unable to grasp the fact that this extra pull in a single-trigger gun, so apparent in the gun-shop, was not necessarily felt in the field. He took up the empty gun, pulled and fired one barrel, pulled again without result, then finally pulled and got off his second barrel. The salesman explained, and the sportsman assented, but said he would have a two-trigger gun, dubious of the statement that the single trigger would be all right in actual firing.

Within the past ten years or so, dozens of single-trigger systems have come and gone. Two-pull mechanisms, timed to act when recoil ceases; three pulls, endeavouring to be constant when actuated by the inconstant element of recoil; some nondescript arrangements, aiming at a construction which combined the two-trigger of old with the chief advantage generally claimed for the single-trigger, viz. giving the same length of stock for the trigger finger when pulling off either barrel.

The latest and most successful example of the one-trigger system is that of Westley Richards. After an exhaustive study of the problem implied in operating both locks of a double-barrelled gun by means of one trigger, this firm was impelled to the conclusion that the complete desiderata of a reliable one-trigger mechanism could not be accomplished in either a three-pull or a two-pull timed mechanism. Both these systems fail to give satisfaction, either on the one hand through the delay that may take place before the second barrel can be fired, or, on the other, through the liability to double discharge.

The cause of these alternative objections is that these previous systems of mechanism are dependent upon recoil. It is a self-evident fact that if the duration of the recoil varies, the mechanism which depends upon recoil to operate it must be affected by this variation. It acts either too slowly or too quickly. If under a heavy recoil the mechanism acts too quickly, the second barrel is ready to be discharged before the gun has rebounded from the shoulder, and in the result may effect the premature or involuntary discharge of the second barrel. If, on the other hand, the recoil is light and short, or of long duration, due to handling the gun in a different way, the mechanism dependent upon it is retarded, and there is delay in firing the second barrel. In order to be absolutely reliable, one-trigger mechanism must be simply and purely of the two-pull order, that is to say, one pull for each barrel, and its action must be independent of recoil.

I have satisfied myself by a thoroughly practical trial of this system in the field upon both game and wildfowl, under varying conditions of sport and of weather, that the claim made by Westley Richards in respect of their one-trigger mechanism is fully borne out in practice. No personal habit or idiosyncrasy, nor exceptional method of handling the gun, can in any way affect its reliability. Moreover, I am well assured that, not having to rely upon that inconstant agent recoil to actuate or to govern its operation, this simple two-pull system always acts the same.

This personal testimony to the complete reliability and effectiveness of the Westley Richards one-trigger is fully corroborated by the experience of the editor of the *Field*, who remarked (July 5, 1902), after thorough trial of this gun : "The gun will adapt itself to practically every conceivable combination of violence or lightness of recoil and suddenness or complete absence of the involuntary pull."

That this device lends itself to the all-round requirements of the sportsman there is abundant evidence, for it has been found to answer satisfactorily when applied to the high-velocity heavily-charged rifles used for shooting big game in various quarters of the globe.

As a gun without a suitable explosive would cut but a sorry figure, it is but natural to suppose that whilst so much attention was being bestowed upon the improvement of the arm itself, its ammunition was also receiving a due share of attention. Our well-known and well-tried friend, black powder—the "villainous saltpetre" of the immortal Shakespeare—was long without a rival in the field of favour as a sporting explosive, and firms manufacturing the most famed brands—Curtis's & Harvey ; Pigou, Wilkes & Lawrence ; John Hall & Sons ; and Kynoch, Ltd.—were for many long years household words with British sportsmen. At length there came a time when the chemical knowledge of certain individuals became concentrated upon the development of a newer and better form of explosive. For a long time the sporting public refused to believe it to be possible for black powder to be improved upon, but with the special acquirements of some of the foremost chemists of the day—men such as Griffith, André, Borland, Jones, Cocking, and Nobel, for instance, who had given a lifetime study to the question of explosives—given full play, the general supersession of black powder was a matter not long to be delayed.

Schultze was the pioneer of the so-called smokeless shot-gun powder. It was introduced in 1868, and for some years remained in a more or less experimental stage. In 1876, the then editor of the *Field*, Dr. J. H. Walsh, was still giving his adhesion to black powder, as the following note shows—

Dr. Walsh, after conducting some trials of black powder *v.*

Schultze, said: "It will be seen that the black powder still maintains its superiority."

The rise of smokeless powder dates from the granulation of Schultze, which powder was subsequently further improved by a process of hardening and water-proofing. At length the general and wide-spread adoption of the smokeless powders for practically all purposes of sport is an accomplished fact, for, coupled with the advantages accruing from the many improvements made in the shot-gun, are those obtained from smokeless powder, which in greater or lesser degree reduces recoil, fouling, and the inconvenience arising from the presence of smoke, reductions adding greatly to comfort and success in shooting. There are now many excellent sporting powders—E. C., Amberite, Kynoch's, and others—which will be treated of in the remarks devoted to "Ammunition."

In concluding this retrospective chapter, I would say that its object has not been to deal exhaustively and in detail with all the various types of sporting firearms that have been made or are now in use. The endeavour, rather, has been to proceed along the lines of selecting those principal inventions which show the order and rate of progress in the gradual development of the modern gun.

Those interested in the subject of modern gunnery will not, in this work, look for any pretension to enlightenment upon the development of the earliest firearm, through its many changes, to the breechloading system in vogue to-day. They would, I imagine, resent such attempt as untimely and out of place; and besides, if they pushed resentment still further, even to stigmatizing it as "ploughing the sands of inquiry," I confess they would be right.

After all, past and present are indissolubly related, and none may gainsay the fact that weapons of our present time, despite new and wonderful departures, and the multiplied items of their design and usefulness, are strongly and unbrokenly connected—albeit at times by a thread fine almost to imperceptibility—with the forgotten weapons from which they sprang.

Critics of modern gunnery—and so I would account all my readers—will in this brief retrospect understand and, mayhap, pardon the intrusion of ancient systems and the dull procession of dates allotted to them, as being a necessary exordium, although well-trodden ground is once more retraced. It should not be dismissed merely as a twice-told tale, but rather viewed as an imaginary leaping ground proclaiming the excellence of the practice *reculer pour mieux sauter.*

CHAPTER II

MODERN SHOT-GUNS

Barrels—Actions — Fore-end Fastenings — Locks, fixed and hand-detachable.

THE constructor of high-class sporting guns must be a man of many parts. In addition to a sound practical knowledge of metallurgy and mechanics, he must be skilful in designing and adapting all parts of the weapon in order to secure from them the due performance of their separate and conjoint functions. To all this knowledge should be added a more or less intimate acquaintance with the varied conditions of sport so that the sportsman may be fitted with guns exactly suited to his requirements.

Sportsmen of the old school may even now be found who see nothing good in the new and everything most desirable in the old. In mournful note they constantly reiterate their belief that the guns of this day are not equal to those of fifty years ago. Lugubrious gunners of the sort are ever ready to draw comparisons altogether in favour of obsolete types of weapon, extolling most, perhaps, their shooting qualities. I venture, however, to remark that non-progressive ideas of the sort arise from a misconception of the true facts of the case ; gunmaking in 1856 and gunmaking in 1906 are totally different matters. Apart from the improvements, little short of revolutionary in character, effected in the mechanism of the arm, we need go no further, in proof of this statement, than the boring of the barrels. As a matter of fact, much less than fifty years ago barrel-boring was purely and simply an "art," a poor rule-o'-thumb art at its best ; now, barrel-boring is an exact mechanical science, the modern barrel-borer constantly working to dimensions of one-thousandth part of an inch.

The Gun-barrel.

The material used in the production of gun-barrels has for the last one hundred years consisted of a figured iron, of which there are numerous varieties. It is doubtless true that this figured iron was first produced from horseshoe nails. The mixture of iron and steel of which barrels are composed, and the processes of manufacture they undergo, give that curl or figure, on subjection to the process of browning, which distinguishes the various kinds of Damascus barrels. In this connection, attention may be called to an erroneous impression prevalent in some quarters concerning the curl or figure of gun-barrel iron. Many people, even amongst those having experience in the matter of guns and shooting, imagine that this figure is entirely superficial, that it is obtained by painting on the surface of the tube, or is so placed by the processes of browning. On the contrary, the figure or curl represents the natural texture of the composite metal formed by the construction of the barrel from layers of steel and iron alternately piled together, and assisted by the further treatment of the tube in the course of manufacture.

The process of browning may be tersely described as a rusting process, strong acids being employed to rust or darken the iron portions of the barrel, and as these acids leave bright the harder steel portions, the existing grain or figuring of the composite metal of the gun-barrel is made apparent. It may possibly be conceded that the figured barrel is fast disappearing, and that in a while the steel barrel will completely predominate. Only in the lower branches of manufacture is the figured iron for gun-barrels insisted upon ; this may be for the reason that the purchaser is aware of the fact that the figured iron has a reputation for reliability and strength. Its surface presents a certain stamp of quality, whereas the dark monotone of the plain steel barrel offers no such ready guarantee. Obviously, the unfigured material affords opportunity to an unscrupulous maker to substitute common iron in the place of reliable steel. There is little cause for fearing that any of our leading manufacturers, with a reputation to sustain, will countenance for one moment the employment of an inferior material in the construction of their steel gun-barrels. Nevertheless, one is forced to the conclusion that were it not for this risk of deception, the demand for figured barrels might cease, and, generally speaking, guns would be constructed with steel barrels. Still, the figured gun-

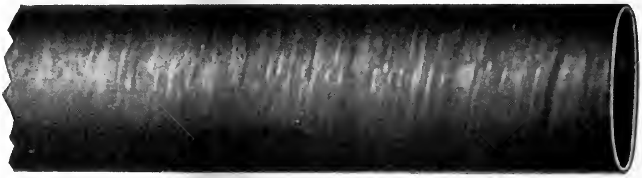


Fig. 3.—Skelp Barrel.

barrel has played such an important part in the gun of the past down to the present time, and has been of such excellent service, both to the gunmaker and to the sportsman, that no record of

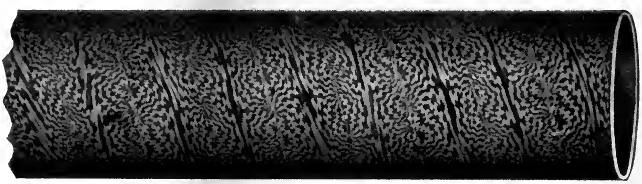


Fig. 4.—Plain Stub Damascus.

modern gunnery would be complete without a brief description ot the various kinds of Damascus iron adopted both at home and abroad. Despite the fact that present indications point to the

Fig. 5.—Boston or Two-stripe Damascus Barrel.

disappearance of the figured iron, it would not be surprising if sportsmen of the future were to return to the early love. It is conceivable that this change might follow merely through the operation of the law of fashion; and, therefore, both on these grounds, and for the conservation of an art that has its root in a deep and interesting past, I hope that the Damascus barrel industry may be kept alive. The different kinds of iron or material mostly in vogue are as follows—

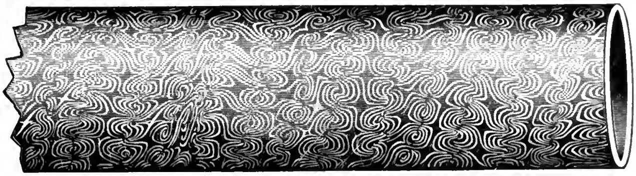


Fig. 6.—Three-stripe Damascus Barrel.

The skelp, the plain stub Damascus, Boston or two-stripe, and three-stripe and four-stripe Damascus.

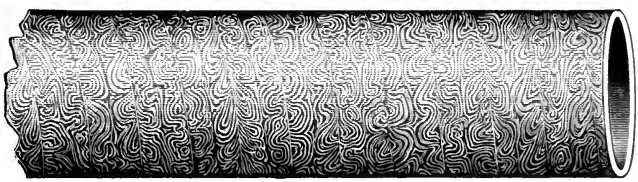


Fig. 7.—Four-stripe Damascus Barrel.

The skelp and plain stub is mainly employed in the construction of the cheaper class of guns (Figs. 3, 4); two-stripe are

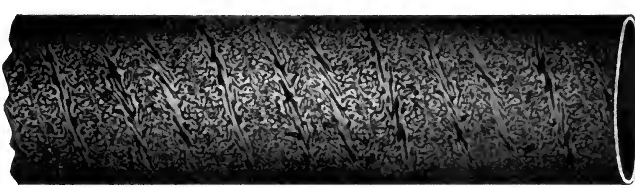


Fig. 8.—Laminated Barrel.

used in the medium kinds, and the three- and four-stripe are usually reserved for use in the higher grade guns (Figs. 5, 6, 7). As a variant of the Damascus three- and four-stripe, there was frequently used a higher class of laminated barrel, which was in fact equal to the very best Damascus barrel, but only differed from Damascus, whose curl of the figure was insured by a just proportion of steel and iron layers properly intermixed, by substituting a larger proportion of the steel layers or piles (Fig. 8). This tended to break the evenness of the figure, and at the same time increased the hardness of the barrel. This breakage of the figure by the intrusion of the larger proportion of steel does not make an unpleasing figure to the eye; the somewhat unequal laminations have an effect of their own, more of a lightning streak breaking through the true proportion of the curl, at first glance somewhat perplexing, but, nevertheless, consistent. This radiating effect, however, is produced at the expense of elasticity or ductility which is mainly characteristic of the Damascus iron, and has proved, under exceptional stress, to be a source of protection to the shooter, the metal stretching instead of

Fig. 9.—Westley Richards Stub Damascus Barrel.

bursting. It is in this respect that the best qualities of Damascus iron have the right to consideration as opposed to steel, and this is further augmented by the fact that the processes of manufacture of the Damascus barrel largely tend to reveal internal flaws or errors, so that the progress of the tube from the various stages of construction is either an assurance of its perfection or an indication of its defectiveness. It may be said of the Damascus barrel that, on arriving at completion, if found free from any serious defect, its behaviour through the various processes and hammering to which it has been subjected have insured for it a character for soundness and solidity. This could not be said of the steel barrel, for at least some years after its introduction; for this, it was known, would carry with it through its various stages some hidden flaw, probably caused in the manufacture of the material—such, for instance, that defect technically know as a "rorque," that may be concealed from sight or examination, and even go as far in the construction of the barrel, that the latter might withstand the severe proof test, thereby, despite the greatest care, constituting no little danger upon a weapon. This is a fair estimate of the distinction between the Damascus and the steel barrel of the past, as apart from other considerations. Now, however, the improvement in steel of reliable quality having advanced so rapidly in the last two decades, it may be considered, at any rate in the higher qualities of tubes, that the steel now employed is absolutely reliable, and is free from all defects, freer indeed than the very best class of Damascus iron at any time used in barrel-making. The hidden defects, the want of homogeneity, alluded to as formerly existent in steel barrels, have been eliminated, and we now have further improvements in avoiding those superficial flaws, mainly eye-

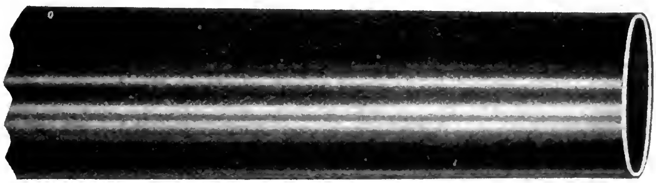


FIG. 10.—UNFIGURED STEEL BARREL.

sores, so prevalent in figured iron, known as "greys." Even as eye-sores these "greys" form a constant source of trouble to the gunmaker, in order that they may be hidden from view. In fact, it is interesting to note that these superficial defects incidental to the Damascus barrel were so general and so troublesome that they actually called into existence a new trade for providing the means of hiding them from the purchaser. This trade was known as "barrel painting." Granting that the steel barrel (Fig. 10) can be made equally sound and reliable with the best forms of Damascus, it possesses enormous advantages from the point of view of stress, and is, further, free from the superficial defects alluded to.

It is only in the lower branches of the trade that steel of uncertain quality is used, but improved methods of manufacture are gradually removing this objection. The methods employed in the manufacture of Damascus or figured-iron tubes differ considerably from those adopted for the production of steel or unfigured tubes.

There are well-known makes of English steel which are thoroughly reliable, such as the Whitworth fluid-compressed steel, and certain Sheffield steels adopted by some leading gun-makers, which possess all the essentials for use in gun-barrels, viz. enormous resisting capacity coupled with ductility. The Westley Richards special steel is a notable example. Whitworth steel for barrels being a monopoly is dearer, and the uniform excellence of its manufacture gives it a high recommendation, but it possesses no advantages over the other special steels at lower prices for shot-gun barrels. There is no doubt that sound reliable barrels made of steel for cheaper guns required for moderate and limited use will shortly be available.

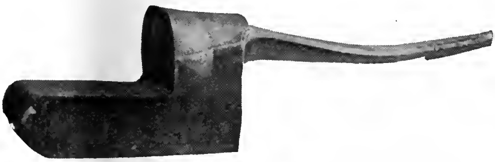


FIG. 11.—ROUGH FORGING OF ACTION-BODY.

Some people have objected that it would be regrettable to lose the pretty and attractive figure upon the Damascus barrel, and it must be conceded that, when properly examined, the contrast between the iron and the steel layers, which have in manufacture been arranged into a series of curls extending from one end of the barrel to the other, is attractive. But as opposed to this, it may be said that this does not at first glance appeal to the observer, a close scrutiny of the barrel is necessary to the due perception of the beautiful work that has been wrought in the manufacture of the perfect Damascus tube. Further, as this attractiveness depends to a large extent upon the browning, which very soon wears off, little excuse is left for the preservation of the figured iron. On the other hand, the highly-polished surface of the steel barrel, with hue as black as the blackest marble or the dead but clear aspect of unpolished ebony, forms an agreeable and pleasing contrast to the marble-grey colouring of the action and the beautifully-figured appearance of the walnut stock.

The Action.

The body of the gun-action, consisting of the standing breech, to which the barrel or barrels are attached, is made from a solid forging of mild steel or best quality iron, as illustrated (Fig.

Fig. 12.—Action-body Complete in the Filed State.

11). It is the part to which the lock or firing mechanism is fitted, as well also the bolts or fastenings which secure the barrels to this body or breech as shown in Fig. 12. At the forward end of this body is the solid joint or pin, upon which

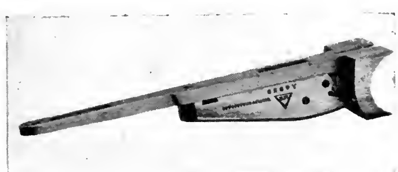


Fig. 13.—Fore-end of Finished Action.

the barrels hinge and are turned on being released from the bolts by means of the top or other lever; thus an easy opening of the gun is effected for the purpose of loading the chambers with the cartridge, and of extracting therefrom the empty shells after firing.

Fore-end Fasteners.

Formerly the simple sliding bolt was usually applied for the attachment of the fore-end to the barrels in all drop-down sporting arms. Although still used occasionally for certain forms of sporting rifle, this is now rarely to be seen on high-grade guns. The following illustrations show the three principal forms of fastening as now applied—

1. The screw-grip, actuated by a lever.
2. The Anson patent sliding bolt.
3. The Deeley-Edge fore-end fastener.

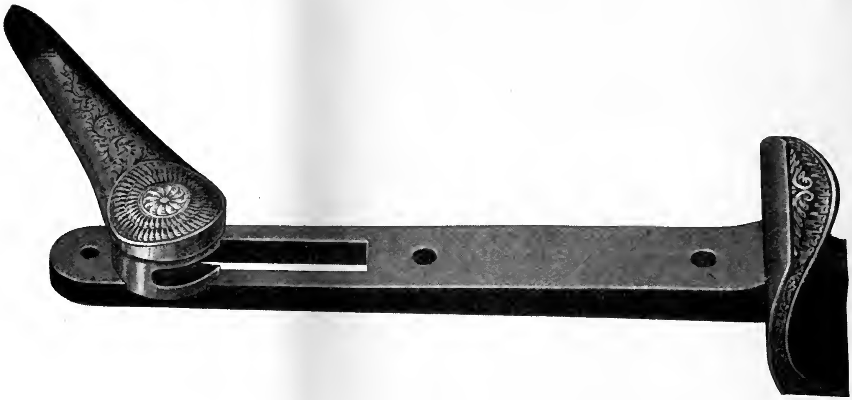


Fig. 14.—Screw-grip Fore-end Fastener.

Of these the two last-named are most generally employed at the present day. The Deeley-Edge is, in my opinion, the most

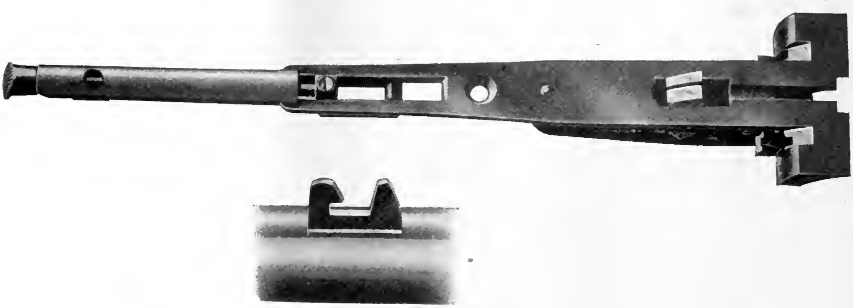


Fig. 15.—Anson Fore-end Fastener.

mechanical, for the reason that it is a compound lever, whereas the Anson or rod form is a simple bolt, which on being pressed down releases the catch, the fore-end still having to be entirely lifted. In the Deeley-Edge the act of releasing the fastener from its catch

FIG. 16.—DEELEY-EDGE FORE-END FASTENER DETACHED.

mechanically applies leverage, which forces the fore-end away from the barrels. In the event of the intrusion of rust, dirt, or in any other case of the fore-end sticking, this mechanical leverage

FIG. 17.—DEELEY-EDGE FORE-END FASTENER.

is of great assistance. The Deeley-Edge fore-end fastener was the invention of Mr. John Deeley, the present chairman of the Westley Richards Co. This system is in general use. Mr.

FIG. 18.—WESTLEY RICHARDS TOP LEVER AND BOTTOM CONNECTING BOLT.

Greener, in his latest edition of *The Breechloader, and How to use it*, gives, without acknowledgment, an illustration of the Deeley-Edge pattern of fore-end fastener, which he calls the "Improved Greener."

Breech Fastenings.

There are those who claim that the barrels of a gun are for

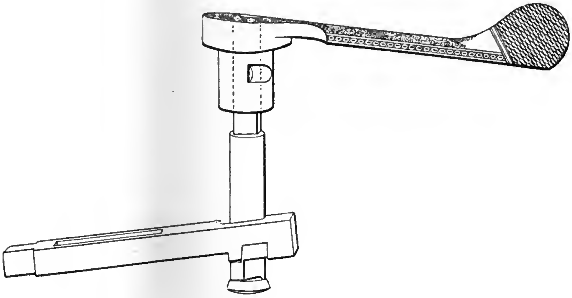


Fig. 19.—Purdey Top Lever.

all practical purposes sufficiently secured to the breech by means of a bolt engaging in their under lumps. But both expert and

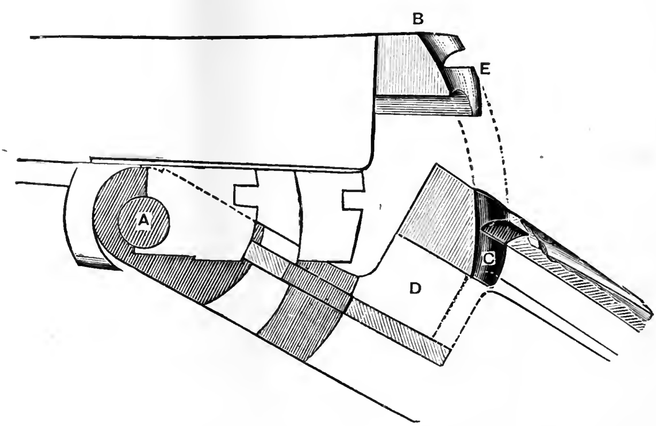


Fig. 20.—Westley Richards Top Rib-extension, with Solid Joint-pin and Bottom Bolts.

sporting opinion has, I think, definitely decided that a top fastening is not only superior, but essential. The late Mr. Westley

Richards used to say that it was more mechanical to bolt at the top as well as at the bottom, and it is not difficult to understand that the bolting power derived from the top position is far greater and more reliable than that obtained from bolting in the under position. The conjunction of the two, however, must be considered better than either one alone, although if one had to make a choice of either a top or a bottom bolt, the top bolt would assuredly be preferred by common-sense.

In a door the bolt or latch is placed at the greatest distance from the hinge in order to provide the maximum of security. The top bolt of a gun occupies the same relative position with regard to the hinge and with the same object. To place a bolt midway between the hinged and the opposite side of the door would be similar to bolting a gun underneath ; and in both cases the holding strength, as we know, is less than in that of the bolt fixed at the furthest point from the hinge.

Although invented in 1858, the extended top rib fastening is a modern survival, and by far the greater number of guns of the present day are fitted with extended ribs in one form or another.

The modern sportsman, therefore, will be interested to know something concerning the top grips or fastenings.

Mr. Westley Richards's original specification claimed protection for an extended rib with hook, eye, or other suitable fastening. He preferred the hook, which is actually a solid piece of steel of dovetailed form receiving into the solid breech. On each side of this rib extension are formed projections or bosses which form the principal features of this top lever fastening. A fastening without these pieces is less solid and not so mechanically sound as the original type.

It will be seen from Fig. 20 that the barrel hinges on the solid pin A. It is jointed on the circle; the solid steel extension B travelling in the radius indicated by the dotted lines, and taking into slot C cut into the standing breech D.

The extension, as stated, is flanged or bossed at E, which flanges fit into corresponding grooves cut within the body. This formation provides a separate fastening, and prevents the barrel from springing forward from the breech under the discharge of the cartridge.

The mechanical value of this construction will be at once

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perceived when it is recognized that the flange or side projections formed upon the extended rib are sufficient in themselves to secure the barrel and action as one solid mass without the aid of the top lever bolt, which indeed forms a secondary part in the arrangement.

Messrs. Westley Richards & Co. have frequently demonstrated that a piece of thread is sufficient to hold down the barrels under firing, or that the barrels so constructed may be held down by hand and firing conducted under such conditions with absolute safety. Further, it has been shown that this top connection, without under grip and with no bolts of any kind either at top or bottom, is capable of withstanding the stress of firing ordinary cartridges. This cannot be said of any other top lever fastening.

When this top lever fastening is made as a cross-bolt—which was included in the original patent—it depends entirely upon the bolt for its support, and consequently is less efficient by the absence of the flange or dovetailed projection, which I have described.

Sir Ralph Payne Gallwey mentions that a gun without a projection would fire 5000 shots a season without symptoms of shakiness, but with the Westley Richards top projection there are authenticated accounts of even more than five times that number being fired out of a gun in one season without disturbance.

But it does not need the testimony of actual use to settle the mechanical superiority of a gun having a top projection together with a bottom bolt as opposed to one only having the latter form to secure the barrels to the gun.

A late editor of the *Field*, Dr. J. H. Walsh ("Stonehenge"), a high authority on gunnery, said:—"To Westley Richards we owe the invention, first, of the top connection, known as his in its entirety; second, of the top lever; third, of the doll's head, used in combination with other bolts . . . the first great improvement in the hinged or Lefaucheux action was made by Westley Richards . . . even the Purdey snap was brought out with a lever under the guard, and indeed so was the Greener cross-bolt."

The Gun-lock.

The lock, or firing mechanism, which has been aptly termed the soul of the gun, constitutes the most important feature of the action. It is worthy of note that the modern gun-lock, simplified though it be, differs in no degree as regards the mechanical construction of its main limbs from the earliest forms of lock mechanism first employed upon guns used to propel shot or projectile by the aid of gunpowder. The main or essential limbs of the modern gun-lock were present in the match-, wheel-, flint-, and percussion-lock; they consisted of a hammer or tumbler, a mainspring, and a sear to engage with and release the hammer, also a searspring.

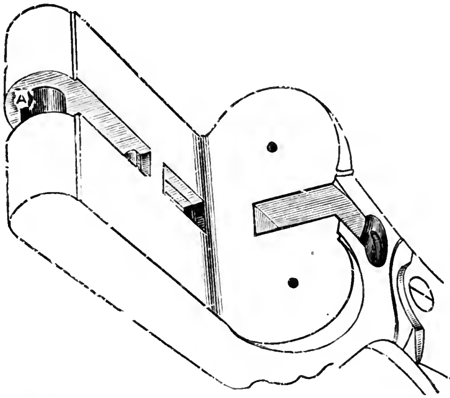


Fig. 21.—Westley Richards Top Lever Breech Fastening and Solid Joint-pin.

For three hundred years or more this combination of parts has satisfactorily performed its work in a variety of systems, and the inventive genius of gunmakers throughout many successive generations has been unable to provide or suggest a simpler or more mechanical arrangement of limbs and springs to efficiently carry out the function of exploding the powder charge.

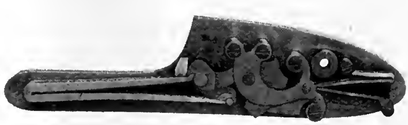
To the true lover of the beautiful in a gun, and he is more often than not the keenest sportsman, the gun-lock makes the strongest appeal as a striking exemplification of the *utile dulci*, and to such, whether the lock be of the ancient flint pattern, made in the past by Durs Egg, Nock, Joe Manton, Westley Richards, Brazier, and other renowned makers, or of the simpler constructions of modern times, pleasure is to be derived from the mere viewing or manipulation of them, apart from their practical use in

Fig. 22.—A Joe Manton Flint-lock.

Consisting of 22 main parts as above; and also fitted with external gravity safety-stop, adding 3 extra parts, 25 parts in all.

sport. The squarely-filed limbs, the smooth action of the main-springs, the rhythmic "click, click," of the perfect gun-lock,

Exterior.



Interior.

Fig. 23.—A Percussion Lock.

is a harmonious combination, proving to well-tuned senses a veritable poem in sound and motion—a melody in mechanism.

All the same, the flint and percussion locks employed in the early muzzle-loading systems cannot compare with the modern hammerless locks for simplicity of design, strength of parts, and lasting qualities. Experience has taught successive generations of gunmakers how to dispense with superfluous parts while retaining all the essentials provided by the main mechanical ideas exhibited in the gun-locks of earliest times. A scrutiny of the various forms of gun-locks reveals the fact that—

1. The flint lock contains 22 parts, including lock-plate.
2. The muzzle-loading and breechloading lock consists of 15 parts.
3. The breechloading lock with external hammers, 17 parts.
4. The latest hammerless lock, as fitted to the Westley Richards gun, consists of seven parts—eight, including the lock-plate.

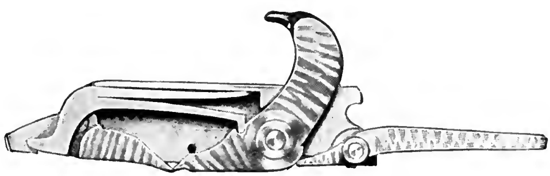


Fig. 24.—The Westley Richards Hand-detachable Lock.

Nevertheless, this latest modern lock retains the four principal limbs in a simplified form, and these it would seem impossible to further reduce or modify.

There are other forms of hammerless lock which, although they are constructed upon the Westley Richards barrel-cocking principle, are complicated to a mechanical degree. Take for instance the overloaded side-lock mechanism shown in Fig. 25, and compare it with the few simple limbs in the Westley Richards lock. Some patterns of the side hammerless lock contain twenty-two limbs, and are even more complicated than the locks of the fast disappearing hammer gun. If we consider their respective mechanical functions it will be seen that a modern breechloading hammerless lock of twenty-two parts, *i.e.* the same number of which the flint-lock is comprised, is even more complicated than the flint-lock itself. The hammerless gun with side-locks is the result of an attempt to maintain the external appearance of the ordinary lock gun with the outside hammers, and at the same time to retain the barrel-cocking principle expressive of the best type of hammerless gun.

This model of hammerless side-lock gun mechanism merits description from the fact that it is the pattern adopted by many London gunmakers of standing, and also of provincial makers whose names justifiably are regarded by sportsmen as a guarantee of sound workmanship.

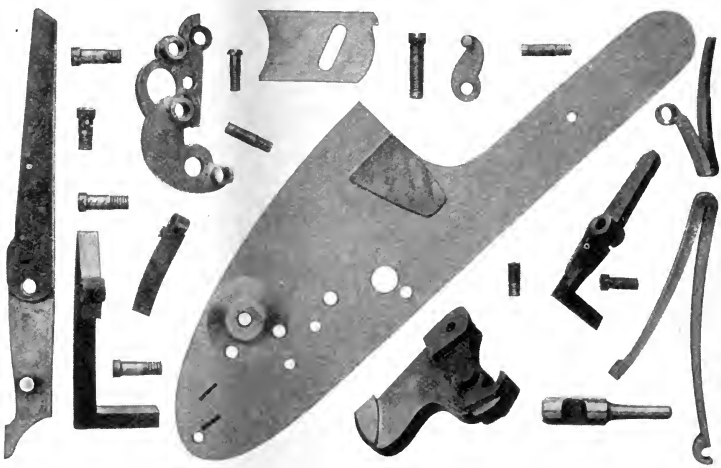


FIG. 25.—THE 22 PARTS OF THE SIDE-LOCK.

I do not consider that it is necessary for my purpose to enumerate and describe the varieties of different makes on this principle, for the reason that I consider that no one will deny that the simpler form of barrel-cocking mechanism represented by the seven-limb lock of the modern Westley Richards (A. and D.) gun represents the highest and most up-to-date development of gun-lock mechanism, and I believe that those gunmakers who adopt this form are enabled to make weapons of greater solidity and durability and with a higher guarantee than guns of any other pattern.

Immediately upon its introduction, the Anson and Deeley was perceived to be superior to all other forms of gun-lock. The manual working of the Anson and Deeley hammerless gun was found easy, certain and quick; the weight and length of the barrels being utilized as leverage for raising the strikers, the simple act of opening the gun putting them to full cock and at the same time locking the triggers—in fact, by this means the gun cannot be opened without the safety-bolt coming into position to justify its name. For further information relative to safety mechanism Chapter III should be consulted.

FIG. 26.—THE 7 PARTS OF THE WESTLEY RICHARDS (A. AND D.) LOCK.

It will be gathered from these illustrations that the working parts of the Anson and Deeley lock are so few and strong that breakage or derangement is far less likely to occur than in the case of gun-locks whose limbs are numerous and delicate. One of the principal causes of the popularity gained by the Anson and Deeley system was the fact that with its few parts it performed with equal satisfaction the work of the gun-lock having fifteen more parts. Thus, the sportsman considered, if seven parts does the work satisfactorily, as we know it does, wherein lies the advantage of encumbering the gun mechanism with fifteen or eighteen extra parts, which at best merely accomplish the same result. Again, the stock of the improved Anson and Deeley hammerless gun has not to be cut away so much internally, consequently it is left in somewhat more substantial form than that of other guns; this also by reason of the fact that the entire lock mechanism is placed within the action body, in which position it is more rigidly located, and is effectually secured from any warping, shrinking or swelling of the wood of the stock or from rust caused by the insidious intrusion of moisture.

Hand-detachable Locks.

The hand-detachable lock strikingly illustrates the fact that so soon as the advanced gun constructor proceeded to design and

Fig. 27.—Hand-detachable Locks: Cover-plate.

file his own gun-locks he excelled all that had been previously accomplished in that direction. This hand-detachability was, as I have already stated, the first improvement effected in the Anson and Deeley hammerless gun-lock during a period of twenty-two years. The advantages of the Westley Richards hand-detachable lock may be summarized as follows—

1. Accessibility.—Removal of the locks is marvellously simple, there being neither screw to turn nor pin to draw, thus affording easy cleaning, so that under the most adverse circumstances the lock need never be dirty nor rusty.

2. Tampering with the mechanism entirely avoided.—Removal of the locks, at once obviating all trouble from meddlesome fingers. How often have sportsmen been warned to remove cartridges from guns before entering the house? Even with such precautionary measure duly effected, accidents with loaded guns cannot be entirely eliminated, for with cartridges lying about it cannot be insured that these will not be inserted within the gun by some thoughtless and irresponsible individual, who may thus bring about an accident. The removal of the hand-detachable locks provides the greatest possible assurance against all accidents of the sort, as it renders the gun completely unavailable for use during the owner's absence. This applies with equal force both

Fig. 28.—Hand-detachable Lock.

Cover-plate off, and lock in process of removal by thumb and finger merely.

at home and abroad, and Indian, African, and other sportsmen who are compelled to leave guns and cartridges at times in the hands of none too reliable servants will especially appreciate this advantage.

3. Duplication.—This easy detachment by hand facilitates the use of duplicate locks. Many sportsmen have at various times felt the need for duplicate locks, but hitherto the necessity for skill in the use of tools has prevented the general adoption of the plan of carrying spare locks. Duplicate locks are obviously useful in the case (*a*) of variation in the pull-off, or (*b*) of breakage, and one cannot always rely on, say, the mainspring standing even in locks the most costly. Those shooters who use extremely light pulls, and are therefore more subject to the annoyance caused by the inevitable variation arising from such

delicate adjustment, will appreciate the advantages conferred by the duplicate locks, which can be substituted in a few seconds. In pigeon guns, indeed with all light guns or rifles, and heavy charges, it is impossible to overestimate the convenience which a readily-attached duplicate lock may afford. It is within the writer's knowledge that the duplicate locks have received the grateful approval of many sportsmen in practical use. There are few sportsmen shooting at all constantly, I imagine, who would refuse to spend something under five pounds for such desirable advantages as the duplication of their hand-detachable gun-locks undoubtedly confers.

4. Familiarity with the Mechanism.—Although somewhat subsidiary to the main points at issue, it is, nevertheless, the fact that the hand-detachable lock does afford the shooter a ready means for becoming acquainted with so important a piece of mechanism as the lock of his gun, and its ready accessibility enables him to observe the care, skill, and finish expended upon the ingeniously-devised limbs which exercise such an important influence upon the efficiency of the gun, all this being for the most part in other systems of lock construction a sealed mystery to the owner.

5. The unique simplicity of the original Anson and Deeley lock is retained in the hand-detachable gun-lock. There is not one part too few, nor one part too many. In comparison with the side form of hammerless lock, there are, as we have seen, fourteen fewer limbs, the Westley Richards lock having seven limbs, all of them stouter and stronger; the hammerless side lock having twenty-one, all lighter and weaker. Judged from the standpoint of practical utility, there can be no questioning the statement that when both are made of materials of equal quality the former will long outwear the latter.

6. Neater finish.—As with the hand-detachable lock there are no pin-holes through the sides of the action-body, the latter is not weakened in any way. So, also, a smoother and more artistic finish is permissible than is the case where unsightly pin-heads are projecting here and there.

CHAPTER III

MODERN SHOT-GUNS—*continued*

Safety-bolts—Ejector—One-trigger

A GUN being a dangerous weapon, all should have an interest in reducing, as much as possible, the risks attendant upon its use. It becomes, therefore, a duty for each one of us to see that "the other man's gun is safe," in addition to being firm in the conviction that our own arm is in that desirable condition. It is mainly for people other than the user that the risks attendant upon accidental or involuntary discharge of the gun exist. As this danger most frequently arises whilst carrying the gun or during the process of loading, that safety-bolt which insures the automatic bolting of the mechanism when loading is completed is indispensable. Most sportsmen are of this opinion, and it is to the general interest that those who are not should come into line. This brings me to the consideration of

Safety-bolts.

Safety-bolts may rightly be regarded as a distinguishing feature of the modern hammerless gun. No previous system was so well equipped with this necessary provision, nor was the need so generally recognized as it is to-day. True, the gun-lock with external hammer had the second bent by which the hammer could be put to half-cock or the safety position; but this arrangement failed to insure the same degree of safety which the modern gun provides, and, moreover, it always had to be carried out by the shooter's own personal intervention. This involved no small element of danger, so diminishing whatever degree of safety it was intended to secure. Cases where danger of accidental discharge becomes a probability arise from circumstances which are present in almost every modern shoot. The crossing of ditches and stiles is productive of accidents, as also the presence of branches of hedgerow or bramble, which frequently become entangled with the triggers. The gun-lock with external hammers was easily influenced under such conditions, and the sportsman thus armed had little choice but to remove his loaded cartridges from the barrels before encountering these natural obstacles. The hammerless gun rendered a twofold service on the score of safety; first, by the abolition of the external hammer, removing a considerable source of extraneous interference; and, second, by rendering this safer mechanism

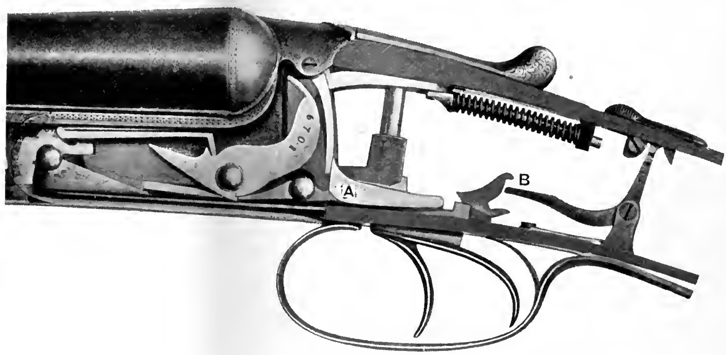


FIG. 29.—TUMBLER AND TRIGGER SAFETY-BOLT.
A—Secondary Sear or Tumbler Safety. B—Trigger or Sear Safety.
The Lock at Cock and Safety Bolted.

absolutely secure by means of the automatic safety-bolt. This latter device insures that whenever the gun is opened for reloading, the lock mechanism is bolted both during the insertion of the cartridge and the closing of the breech, and, further, remains so until the shooter removes it by pushing forward the little thumb-slide by which it is actuated externally. The simplest and most effective form of safety-bolt is the trigger safety, which is generally used upon the Anson and Deeley gun, and has for more than three decades proved itself thoroughly efficient.

Some critics claimed in the past that the trigger safety was not sufficient, and that it was necessary to supplement and reinforce this thoroughly effective arrangement by the addition of a safety to bolt the tumbler. Never was there a greater misconception. It is conceivable that it would be mechanically sounder to directly bolt the tumblers instead of indirectly through the trigger or sear, but this argues the far-fetched assumption that the sear is liable to breakage. As a matter of fact, even in the old two-bent hammer gun breakage of the sear was a most rare occurrence, although there put to severer use. In the wider and stronger limbs of the Anson and Deeley gun, and its simpler function, a broken sear, it may be said, never occurs. But no argument can support the addition of a tumbler safety to that of the satisfactory trigger safety; and close consideration of the question shows that guns fitted with the tumbler safeties, so-called, are less safe than even those guns which have no safety-bolt at all. The demand for tumbler safeties appears to have been made principally upon the assumption that the sear would break, if not, there was no ground at all to ask for its adoption. Its usefulness was entirely problematical, for it could only operate in the case of a broken sear. A sear, it has been conceived, might break either when the gun is (1) in the uncocked or (2) cocked condition. Taking these positions in the order given it may be said that—

(1) The gun but for the existence of the tumbler safety would not cock, and, therefore, the tumbler safety or secondary sear would, in the case of a broken sear proper, thus assume the function of the latter; or (2), in the event of a sear breaking when the gun is cocked, the tumbler safety or secondary sear is supposed to act so as to retain the hammer in the armed position, and therefore prevent a premature and maybe dangerous discharge. As neither extreme case is likely to arise, necessity for this additional limb, the tumbler safety, does not exist. In the foregoing statement I have dealt with those advantages claimed for the tumbler safety, supposing it to be operative and called into use; and even granting it fulfilled all these purposes or functions, the drawbacks in other directions resulting from its use more than outweigh any possible benefit. Let us consider them.

The most approved form of tumbler safeties are duplicate or secondary sears, only differing from the ordinary sears by the position with which they engage with the tumbler or hammer. Like the ordinary sears, they are lifted from the position of detaining the hammer by the trigger when it is pulled, operating the sear proper, and in the same way they are controlled by a spring whose weight has to be lifted with or overcome by the trigger. It is, therefore, obvious that a tumbler safety must have a spring of sufficient weight to make effective its engagement with the tumbler should its service ever be needed in case of the anticipated breakage of the sear whose place it would have to take.

This spring, to be effective, must weigh somewhere between $1\frac{1}{4}$ and 2 lb.; on some guns it has been found to be over, therefore, on a gun which has a pull-off of, say, $4\frac{1}{2}$ lb., if fitted with tumbler safety, the actual weight of the sear and spring and

Fig. 30.—Tumbler Safety Bolt or Secondary Sear and Trigger Safety.
A—Secondary Sear or Tumbler Safety. B—Trigger or Sear Safety.
The Lock at Rest and not Safety Bolted.

trigger proper would only be $2\frac{1}{2}$ lb., as it is obvious that the $4\frac{1}{2}$-lb. weight which the trigger has to lift consists of 2 lb. tumbler safety spring and $2\frac{1}{2}$ lb. sear pull, while if the same gun were made without tumbler safety and with the same weight of pull from the trigger: *i.e.* $4\frac{1}{2}$ lb., you would actually get all the $4\frac{1}{2}$ lb. on the sear pull itself, and so have a 2 lb. greater margin on the pull with which to resist accidental explosion arising from jar of any kind, either through the firing of one barrel affecting the other or through dropping the gun. In a word, a gun with a $4\frac{1}{2}$-lb. trigger pull without tumbler safety is safer and less liable to accidental discharge than a gun with tumbler safety where a pull-off of $4\frac{1}{2}$ lb. is composed of $2\frac{1}{2}$ lb. actual trigger pull and 2 lb. tumbler safety spring.

Many cases have been brought to light where these so-called tumbler safety bolts have been fitted to guns, no doubt at the instance of sportsmen with little knowledge who have been taught to believe in the efficacy of these additional limbs, so frequently paraded in advertisements and catalogues as augmenting the safety of the ordinary lock mechanism ; and in such guns it is true that the tumbler safety was present, but had been rendered totally ineffective even under the circumstances of a breakage of the limbs, in which case it was supposed to be of service, but would not have served any purpose at all, because in order to get a safe pull-off proper its spring was weakened, so that the tumbler safety could not have performed the function of a sear, and was only a sear in name.

These tumbler safeties doubtless influence the superficial dabbler in gun mechanism, who before ordering gets up a smattering of the essential features gathered from advertisements of what is recommended as a modern arm ; and many salesmen doubtless find that to expatiate upon a tumbler safety as a necessary equipment of reliable mechanism constitutes what the Americans call "a talking point," otherwise, polite commercial deception—it is that and nothing more.

They may be characterized as useless encumbrances, and it is no exaggeration to say that the majority of high-class guns of the best type are made without them. As the particular form of tumbler safety referred to above, which represents the best of its class, was introduced by Westley Richards, the fact that they discarded it fifteen years ago as an unnecessary encumbrance, rendering the gun less safe, forms the most adverse criticism possible in reference to this question. I have noticed that Mr. Greener's guns are not encumbered with tumbler safeties ; this, indeed, is what might be expected from so practical a gunsmith. To sum up the whole question : Jarring off is caused by the trigger. Jar does not affect the mechanism direct, but only through the trigger. I have tested a gun which with both triggers attached jarred off the second barrel through the explosion of the first barrel. Under the same conditions, but with the left trigger removed, the firing of the first barrel invariably failed to jar off the second barrel. This confirms a similar experiment made by Westley Richards with a double ·500-bore

Express rifle, and reported in the *Field* of May 19, 1894. It conclusively proves the statement I began with, that jar-off comes through the trigger alone.

If, therefore, a tumbler safety is applied to the lockwork, with the object of checking the fall of the tumbler, and that limb is lifted or controlled by the trigger, it will certainly not prevent a double discharge, because jar, which we have seen is contributed through the medium of the trigger, would operate the safety limb before reaching the sear itself. All tumbler safeties are controlled by the trigger; in other words, the tumbler safety of necessity must be lifted out of the way before the trigger can engage with the sear proper, and thus a jarring trigger would first come in contact with the tumbler safety and so render it useless.

Certain people have argued that a secondary sear is necessary as a safeguard as against the intrusion of rust, dirt, clogged oil, etc.; but it appears to me this argument is based on the assumption that the sear proper could alone be so clogged, and that the secondary sear could not be so hampered.

On the introduction of the Anson and Deeley gun, doubt was expressed as to its safety, and an eminent gunmaker challenged the inventor to a test of dropping the gun, without any safety-bolt, from a considerable height upon its butt to the floor. This was repeatedly done until the stock broke, the severe concussion of the fall failing, however, to discharge the mechanism. At another time, before various critics, some twenty guns of high-class manufacture—priced at 60 guineas and so on—were dropped from the upright position, muzzle resting on the floor, with a trigger safety-bolt on, and even the enormous jar which the breech received from this severe test failed to discharge the trigger. The costliness or such an experiment might have been great, as thereby might possibly have been involved an outlay for new stocks and so forth of £200 or £300; but such was the certainty of the expert's position that, merely to refute an academic criticism, he was willing to encounter so great a risk. Nasmyth was no more sure of his ponderous steam-hammer when he demonstrated his ability to crack a nut with it without injury to the kernel, than was this expert of his gun-locks.

As an instance of what may occur to the sportsman on a rugged moor, a man fell down a steep declivity with his loaded gun with the trigger safety on. The barrels were buckled, the stock smashed, but no personal damage resulted save that affecting the pocket to the tune of a new gun. This happy escape was due to the fact that the safety trigger mechanism had prevented the discharge of the gun. Guns without safeties may be safe, but the gunmaker, acting from the experience gained from many clients in all quarters, prefers and recommends a safety-bolt. We may infer that if he does so, it will insure that all mechanism of whatever system is the better for the provision of a safety-bolt. Sportsmen will therefore be well advised to sink personal habits and tastes and adopt an automatic trigger safety-bolt as the only means of preventing those exceptional accidents which may arise even when the utmost care is used.

Ejecting Mechanism.

Mechanism for the automatic ejection of exploded shells has now come to be looked upon as a necessary feature in the modern

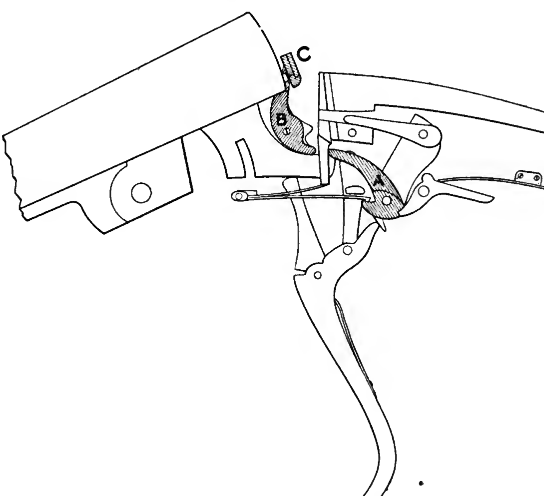


Fig. 31.—Needham's Ejector.

shot-gun. Certainly no gun for use where game is at all plentiful can be said to be complete without ejecting mechanism. This is invariably placed in the fore-end of the gun.

It is probably correct to say that the first idea of a practical

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ejector mechanism is due to Needham, nephew of one of Mr. Westley Richards's best finishers, in whose arrangement we find a separate extractor employed for the purpose of extracting and ejecting each individual cartridge. Previous to this arrangement two separate extractors had been employed in double-gun mechanism; this is evidenced by the Bacon gun. The novelty of their employment in the Needham system consisted in their use or combination with a lever fixed in the lump of the barrels. This effected the starting of the extracting mechanism by leverage, and then flipped out the case from the barrel by the pressure of the mainspring accelerating its motion. This system has not had a large vogue; there were objections both in regard to the difficulty with which the gun was opened, and also in respect of the taking of the gun apart for putting away in its case. It is, however, one of the first successful ejectors from a mechanical point of view, and represents a distinct type just in the same way as the Westley Richards is distinguished from all others. By the Westley Richards system the extraction and the ejection are effected by two separate mechanical contrivances as opposed to the Needham, in which the same limb for extraction and ejection is utilized. The Westley Richards ejector, in fact, retains the old method of moving the cartridge from the barrel by a lever placed in the fore-end, or upon a joint in the gun which carries the extractor so far from the barrel that the empty case can, if necessary, be removed by hand, and the extractor leg is lengthened backwards for the ejector mechanism to actuate, by its hammer forcibly striking the end of the extractor rod and so flipping out the case. This separate provision for extraction and ejection, which is a special characteristic of the Westley Richards ejector, excluded the possibility of a disarrangement of the ejector interfering with the ordinary extraction, which, in the Needham was likely to arise, and so render the gun useless; but there are further mechanical differences which place the two systems almost at opposite poles, and that is that the Needham ejector had no communication with the fore-end. The fore-end ejector, viewed mechanically, is the best type of ejector, and experience of it, and the large number in use in all parts of the world, amply confirm this opinion.

In the Westley Richards ejector those three main limbs—hammer, mainspring, and sear—so well-known as the ordinary gun-lock, are utilized for expelling the fired cartridge-case from the barrel. As a matter of fact, in this ejecting mechanism, we have a replica in miniature of the firing lock; that is to say, a pair of locks reduced in size, but possessing the simple features of the

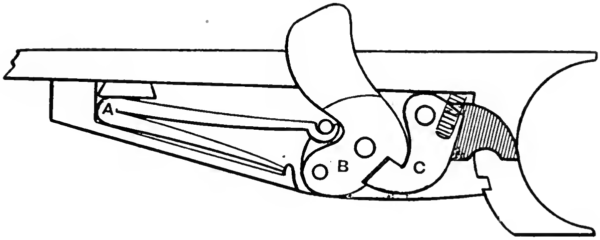


Fig. 32.—The Westley Richards Ejector Lock.

There is no frictional pressure of the spring **A** and hammer **B**; this is avoided by swivel connection, and also by the use of a sear limb **C**, which, while holding back the hammer, forms a dead stop, from which it is lifted to allow the hammer to flip forward without friction.

strongest and most widely-approved type of modern gun-lock, are compactly enclosed within the fore-end of the gun in order to effect the complete expulsion of spent shells. In this arrangement the hammer is used for striking upon the rearward end of

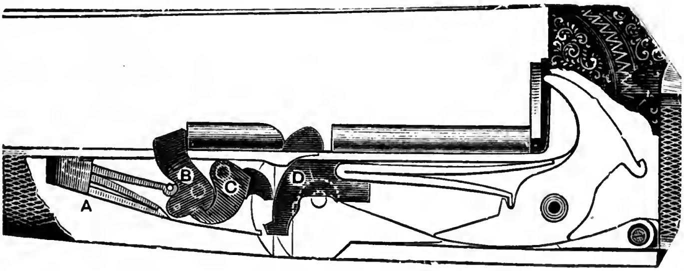


Fig. 33.—The Westley Richards Ejector Complete.

the extractor rod in the same way that the gun-lock hammer strikes upon the cap to ignite the cartridge. This system differs from any previous attempt to accomplish a perfect system of ejector mechanism, and originates a novel method of selecting the cartridge-case proper for ejection. Each barrel is fitted with an independent ejector lock, the hammer of which is released by engaging with a simple limb or slide D connected with the mainspring of the gun-lock, this limb being urged into position by the fall of the hammer in firing the cartridge, and held there during the opening of the gun to reload. In the action of opening the gun this limb D comes in contact with the ejector sear, and so releases it from engagement with the ejector hammer. It was this ingenious and reliable arrangement which stamped this mechanism with the hall-mark of genius, and proved it an achievement worthy to rank with other developments of first-rate importance in the firearm. The application of springs to the extracting apparatus was, in itself, an obvious and simple plan, but

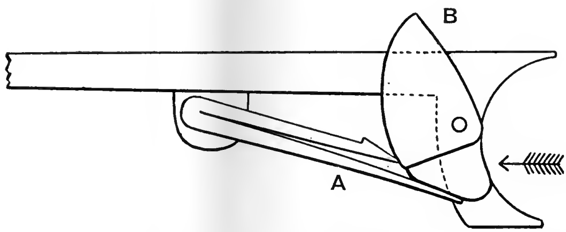


FIG. 34.—THE SOUTHGATE EJECTOR.

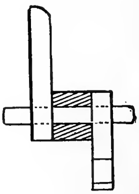


FIG. 35.—END VIEW OF SOUTHGATE HAMMER.

When **B** travels forward sufficiently far to pass the centre, the spring **A** flies open and flips it forward for the remainder of its distance. The hammer **B** and spring **A** are always in frictional contact.

no such arrangement could be regarded as of the slightest practical value unless it included a satisfactory selective method as described.

In action, the drop of the barrels in the Westley Richards ejector gun calls forth two complete operations. First, the primary movement towards the extraction of the cartridges from their position in the chambers is made by the powerful leverage of the ordinary extractor as worked by the drop of the barrels. This draws out equally both live or spent cartridges. Here, in the case of the unfired cartridge, the process of extraction is complete, but not so with regard to the spent cartridge, for this movement actuates the ejector lock, which then forcibly expels the fired cartridge. This mechanism is thus automatically selective, the live cartridge remaining in *statu quo*, the exploded shell being forcibly flipped from its position.

Having regard to its excellent mechanical arrangement, and its thoroughly efficient performance throughout many years of service, there is no doubt that to the Westley Richards ejector pride of place must be given. Still, there are some who claim that a certain modification of this system is also efficient. This is the Southgate mechanism, generally known as the two-piece ejector, which embodies the main mechanical principle of the Westley Richards, as regards selecting the order of expulsion through the fall of the hammer, but modifies that system by the abolition of the sear. By omitting the sear and substituting for it a double-sided hammer, a great sacrifice of efficiency and true mechanical arrangement is made. One arm of the mainspring serves to detain the ejector hammer by pressure upon the extra side, but it is a frictional contact, which is decidedly inferior to the perfect mechanical engagement of the hammer bent and sear nose in the Westley Richards ejector. As the barrels drop on opening the gun the double-sided ejector hammer is moved round so that when it travels over the centre the frictional-detaining spring is freed and flips the ejector hammer forcibly against the extractor leg.

Briefly put, the disadvantages of a two-limb system of ejector are as follows—

1. It is frictional, consequently more susceptible to wear.
2. It is more difficult to time.
3. The opening and closing of the gun, and the working of the ejector, are not so smooth as with the gun-lock and sear ejector.

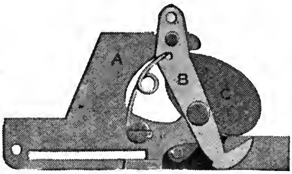
I have not the slightest doubt that excellent guns have been turned out fitted with the "two-limb" ejector, and that these, more especially in the higher grades, have given their owners satisfaction. This appears to me to be owing quite as much to the special care and attention, and the fastidious niceties of adjustment, which the higher class gunmaker is able to bestow upon his guns fitted with this form of ejector, as to the intrinsic merits of the mechanism. It is simply an acknowledgment that, despite mechanical shortcomings, the skilled specialist, with considerable outlay of time and money, succeeds in obtaining efficient action. In the mind of the impartial mechanical expert, no doubt exists respecting the superiority and greater reliability of the Westley Richards system of miniature gun-lock ejector, with its hammer, mainspring and sear, as compared with the friction-bearing "two-limb" ejector, or, in fact, any other ejecting mechanism now in use.

As touching the sear and its important value in lock mechanism, the significant fact may be stated that no gun constructor has ever claimed that a gun-lock can be made efficient without a sear and tumbler bent. Indeed, no gun-locks are made without a sear, which is rightly acknowledged to be an indispensable limb, and it is no less indispensable in an ejector lock than in a gun-lock, from a mechanical point of view.

Statistics, and the collective experience of a vast body of sportsmen in this and other countries, sufficiently corroborate my statements. Recently, when at the Westley Richards manufactory, Mr. Leslie Taylor showed me a letter from Great Falls, Montana, U.S.A., wherein an old client stated, "I send you the ejector-box from my gun. The left stopped working the other day. I have shot the gun for twenty years this coming summer, and it has never failed me before." This assuredly is strong testimony to the mechanical soundness of this invention, for this particular ejector proves to have been one of the earliest made on the Westley Richards system.

One-trigger Mechanism.

Now that the sporting world has been put in possession of a one-trigger mechanism for operating both locks of double guns or rifles which is mechanically sound in principle as well as smooth and quick in its action, the widespread adoption of this great aid to sport will probably not long be deferred. The mechanism of the early patterns of single-trigger was actuated by recoil. The control of the movements thus depending upon an uncertain and variable agent may sufficiently explain the fact of their adoption having literally "hung fire." The particular example now to be described is open to none of these objections; it has proved itself, under exceptional stress and strain, to be thoroughly reliable, as subjected to all conditions of recoil and wear and tear. I refer to the one-trigger mechanism as applied by Messrs. Westley



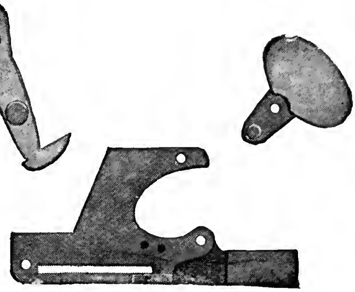


FIG. 36.—THE MECHANISM DETACHED.

FIG. 37.—THE MAIN LIMBS, SHOWN SEPARATELY.

A is the lifting or firing plate. **B** is the safety spur.
C is a weight which moves under recoil.

Richards to actuate both locks of a double-barrelled shot-gun or rifle.

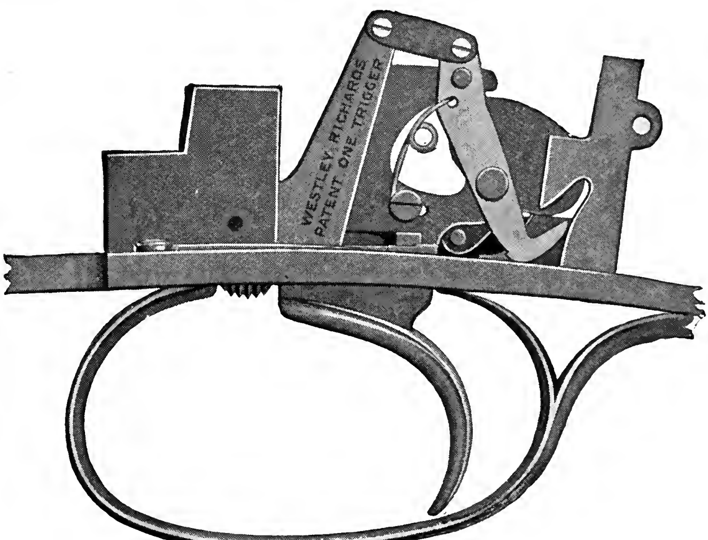


FIG. 38.—SHOWING THE MECHANISM WITH THE PARTS IN A POSITION TO FIRE THE FIRST BARREL.

After practical trial of this system in the field, under every conceivable condition of weather and circumstance, I am perfectly assured as to its thorough reliability and efficiency. I have shot with the Westley Richards one-trigger as applied to guns of various calibre, 28-bore ball- and shot-guns, 12-bore game-guns, and even in a $13\frac{1}{2}$-lb. 8-bore duck gun, firing heavy powder charges and $2\frac{3}{4}$-oz. shot loads, and have neither hang fire, miss-fire, premature nor double discharge to record. That this system of discharging either barrel of a double gun by means of one-trigger is purely mechanical is proved by the fact that the locks are

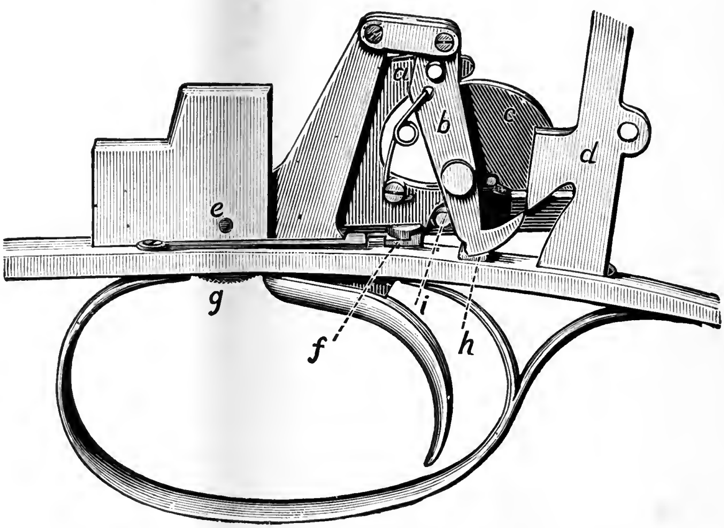


Fig. 39.—Showing the Mechanism with the Parts in a Position to Fire the Second Barrel.

worked just as freely without cartridges as with—that is to say, with gun empty as with gun loaded—which shows that recoil plays no part whatever in the movement. Thus I find that whether the recoil be so light as to be imperceptible or exceptionally heavy, as in the case of the double 8-bore above mentioned, this one-trigger action works smoothly and with unfailing regularity. As will be gathered from the accompanying illustrations, the Westley Richards one-trigger mechanism is simplicity itself, the motion being effected by three main limbs of plain and strong construction.

Here A is the lifting or firing plate, B the safety spur lever or detent, and C is a weight whose gravity pushes the toe of the safety spur under the post D (shown in the complete mechanism), and prevents the firing plate A reaching the second sear.

In this arrangement the pulling of the trigger causes the firing plate A to rise and discharge the first barrel, at the same time the spur lever B engages with the hook of the fixed pillar D, in this position preventing the premature discharge of the second barrel. At the instant the action of recoil and rebound of the gun from the shoulder cease the safety spur B leaves its position of safe, and the trigger can be pulled to fire the second barrel. In the latter illustration F is the selective lever which is moved across from right to left by the button G. This enables the shooter to fire right-left or left-right just as he pleases, the combination being continuous until the button is again moved to reverse the order of firing.

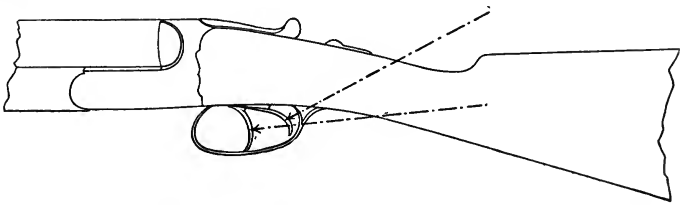


Fig. 40.—Direction of Pull for Fore and Rear Trigger.

The one-trigger system is of real advantage, it is not a mere addition of novelty conferring no practical benefit, as many sportsmen still believe who have not put it to the actual test of a season's shooting. Those gunmakers who first adopted a single-trigger system are perhaps responsible for this attitude, because of their failure to place before the public succinctly and convincingly an accurate account of the advantages which the system brought about.

It has been hastily assumed that the one-trigger gives the same length of stock for both barrels, whereas in the two-trigger you have a different length of stock for each barrel. This is a fallacy. Nevertheless, sportsmen have been taught to believe this constantly-reiterated claim, and to regard it as the sole advantage of the one-trigger system. This question will be fully dealt with under the subject of gun-fitting.

The true advantage of one-trigger instead of two, considered in relation to measurement of the stock, is that the motion of the hand necessary in a two-trigger gun for operating the two triggers respectively is rendered unnecessary, for with the one-trigger gun the sportsman always pulls from practically the same point. Further, the triggers of a two-trigger gun are of different shape, the front trigger is almost a semi-circle, while the rear trigger consists of a long arm terminating in a short curve; two shapes entirely differing, and necessitating an entirely different direction of pull, as will be gathered from the accompanying illustration, Fig. 40.

The different directions at which the finger pulls when firing alternately the two barrels, as will be seen, involve a change of position of the hand upon the grasp of the stock for each separate shot. This is a disadvantage of the two-trigger system, because it is obvious that a change of position of the firing hand requires a readjustment of the gun to the shoulder, which, however unconsciously performed, nevertheless tends to lessen the steadiness, speediness and accuracy of aim. These objections do not occur in the one-trigger system, which, on the contrary, ensures the same position of the gun to the shoulder for both barrels. This follows from the fact that the sportsman operates the one-trigger from practically the same position, and always at the same angle or direction of pull.

A further advantage arising from a satisfactory one-trigger is, that it may be fired with greater rapidity than is possible to be done with the two-trigger gun. While it is admitted that the fault of many shooters is to fire too quickly, with unstudied aim and without that cool deliberation which is necessary for success, it may be remarked that such hasty sportsmen are just as liable to fire a two-trigger gun with unexpected rapidity as they are to fire a one-trigger, and, of course, for the reasons above given, the errors of aiming would be minimized with the latter gun.

In dealing with this question of speed, it is, therefore, only necessary to consider those cases where increased speed over the two-trigger system becomes absolutely indispensable, if the sportsman is to increase his chances of success against the quarry. Thus there is this advantage to be laid to the credit of the one-trigger, that it enables the shooter to perform more satisfactorily in those cases where quick shooting is essential to kill, and in such, the one-trigger would have the advantage over the two-trigger. The speed of birds differs, but take the case of a bird which, we will say, is travelling at the rate of 65 feet per second, in such a case it is not difficult to recognize the importance of possessing a mechanism which can be fired so much more quickly than a double-trigger gun, that from 10 to 15 feet is gained upon a crossing object. This extra speed in firing, to put it in other words, is practically an equivalent to removing a handicap of 4 yards. The advantage of this quicker firing is due to a special feature of the Westley Richards system, viz.—

The Release.

In imperfect systems of one-trigger, the failure of the second barrel to go when attempting a quick double shot is often due to the fact that in all of these former systems, the amount of release necessary before pulling to fire the second barrel has been entirely too much. When firing the first barrel, the trigger moves backwards about three-sixteenths of an inch, and before pulling to fire the second barrel, it has always heretofore been necessary to allow the trigger to move forward even more than it moves backward; this is called the release. The consequence is that often in the case of a quick double shot a sportsman fails to allow the trigger to move forward all this long distance, with the result that the second barrel refuses to go when pulled. Long experience of practical use in the field and of tests have conclusively shown that to the vast majority of sportsmen any forward movement of the trigger in excess of one-sixteenth of an inch is fatal to a quick double shot. When the release is more than this thick warm gloves cannot be used successfully.

The short release of the Westley Richards one-trigger may be best illustrated by the accompanying drawing, which shows the vast difference in this important respect between this system and previous single-trigger arrangements. When the trigger is pulled to fire the first barrel, it will be seen that the dot A of the trigger moves to the dot C, that is, three-sixteenths of an inch. Now, the trigger does not have to return to the dot A before it can be pulled to fire the second barrel, which was necessary in all previous systems. It only returns to the dot B less than three-sixty-fourths of an inch. The mere relaxation of the muscles is sufficient to cause this release, hence the second barrel never fails to go because of insufficient release of the trigger, which was a serious source of difficulty in other systems. It is a very simple matter to have a long release; it is a very difficult matter to have a short one, and examination of a variety of systems has shown that the release of the Westley Richards trigger is the shortest in existence, consequently a sportsman can make a double shot

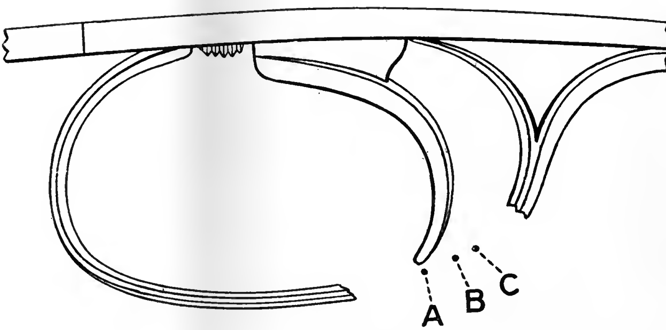


FIG. 41.—WESTLEY RICHARDS ONE-TRIGGER RELEASE.

quicker with this short release than he can with a long one, just as he can travel 10 feet in less time than he can 20 feet. A long release seriously prejudices the shooter, either he cannot fire at all, or if he fires the readjustment of the gun to the shoulder is necessitated, and in any case it means inaccuracy—probably a miss.

In the *Field* trials of this mechanism it was stated in respect of this release, "that the draft of the trigger is normal for both barrels." The two causes of trouble confronting the constructor of a satisfactory one-trigger have been friction or recoil, and these two causes have been eliminated by the one-trigger system adopted by Westley Richards.

A further advantage of this system, which is independent of recoil, may be stated as being of importance to rifle sportsmen who frequently require a quick double shot, with steady and reliable aim. This the one-trigger alone confers, but it must be seen that this advantage is not accompanied by any drawback in firing. For instance, in the case of a three-pull system the intermediate pull is actuated either by the recoil or by the personal pull of the sportsman; thus delay occurs if the recoil fails to do its work, as in the case of a miss-fire through a faulty cap or other cause. The sportsman under such circumstances cannot immediately fire off his second barrel, because the intermediate mechanism dependent on the recoil of the weapon for its action would not have operated. In such an instance, therefore, the sportsman would first have to pull the trigger to release this intermediate mechanism before he could pull again to fire the second barrel. This delay in the firing of the two barrels under such circumstances might be serious if at the time he were confronted by a dangerous beast. Points such as these may seem trivial enough in the gun-shop, but he who follows tiger in Indian jungle, or lion or elephant in African forest, cannot afford to disregard them. Now, should a miss-fire of the same kind and under the same circumstances occur with the Westley Richards system, this difficulty does not arise, there would be no delay in firing the second barrel, as the second barrel can always be pulled just as quickly whether the recoil takes place or not, for this one-trigger has not an intermediate pull.

Summed up briefly, the Westley Richards one-trigger mechanism may be said to possess the following advantages over its many predecessors—

1. Recoil, an inconstant and uncontrollable medium, is not employed to operate the mechanism. This same recoil was the *ignis fatuus* of many previous inventors, and its very inconstancy proved the stumbling-block to a successful issue of their schemes.

2. Timing mechanism, which has a fixed duration of action, and which obviously cannot be adapted to the varying periods of time during which recoil may act, is not employed.

3. The release of the trigger, that is, the amount of travel or duration of movement requisite to fire the second barrel reaches the irreducible minimum. Thus the two barrels may be fired quickly without the finger being removed from the trigger. In

some other systems it is necessary for the shooter to remember to release his finger from the trigger, and if he fails to do this the firing of the second barrel is delayed. Although to some shooters this possibly may not be an objection, it is but fair to remark that as the Westley Richards one-trigger successfully abolishes it, that form of trigger mechanism is suited to all types of gunners, no matter what their personal idiosyncrasy may be, nor how they handle the gun.

4. Its greater rapidity of action is not obtained at the cost of safety, double discharge through involuntary pull, or under any circumstance of manipulation, being absolutely impossible.

5. It also on this account is safe and most suitable for application to the high velocity or large calibre rifles and duck guns, with their heavy charges and recoil.

6. Miss-fires do not affect its working, and this is an important consideration where big and dangerous game are confronted. Even under the circumstances of a miss-fire in the first barrel through a defective cap or cartridge, the firing of the second barrel is not delayed. In the event of a miss-fire with the first barrel of a gun on the three-pull recoil actuated system, the intermediate, or as it has been termed involuntary pull, then has to be voluntarily performed, so causing delay, and where danger lurks, as in tiger shooting, this may prove a serious matter.

7. Two pulls only. No intermediate pull.

8. It is fitted with a selective action, which enables the shooter to choose which of the two barrels he shall fire first.

Amongst the multitude of single-triggers that has been devised, that of Westley Richards stands in a class by itself, both in mechanical principle and structural design. The Editor of the *Field*, in his report of July 5, 1902, states that it enables Messrs. Westley Richards to challenge the most severe tests with their mechanism. From various independent tests I extract the following particulars :—

1. Sand was placed all over the mechanism, and allowed to penetrate between the parts, and the gun repeatedly fired under every conceivable condition of holding and pulling, but it never once refused to act properly. This severe sand test convincingly

demonstrates the strength and efficiency of the mechanism. The Editor of the *Field* reports on this test, "It fired satisfactorily."

2. Light trigger-pulls and heavy charges of black and nitro powders have been frequently tried, and from these numerous trials the following may be selected:—Pulling the right barrel first, the left pull being extremely light, viz. actual weight $2\frac{1}{4}$ lb. Repeatedly shot with 42 grs. and $1\frac{1}{8}$ oz., and 45 grs. and $1\frac{1}{4}$ oz.; also with $3\frac{1}{2}$ drs. of black powder and $1\frac{1}{4}$ oz. of shot. The gun was held in every conceivable position, and pulled in various ways. To instance some:—

(*a*) Gripping hard against the shoulder.
(*b*) Held loose at the shoulder.
(*c*) Held in the air away from the shoulder, and allowed to recoil heavily against it and rebound again.
(*d*) Firing in all these positions with the finger held stiff against the trigger.
(*e*) Resting the gun upon the hand, and allowing another person to pull the trigger while in this position in every conceivable way.

"Every apparent requirement of a single-trigger action seems to have been met by some application of mechanical movement."—Editor of *Field*, July 5, 1902.

All these tests were carried out on various occasions by different shooters, and in no instance could the mechanism be made to fail, either in simultaneous discharge, or delayed action, or in any other way.

With single-triggers having the two-pull timed mechanism there is liability either to double discharge or to hang when attempting to fire the second barrel. Two barrels going off together or delay in firing are both objectionable features.

With the three-pull mechanism the intermediate pull depends for its actuation upon recoil, which is an inconstant agent in itself and varies with the different methods of holding the gun or other personal idiosyncrasy. Thus again sportsmen complain that they get delay in firing or a double discharge.

At the head of the many three-pull systems undoubtedly stands the Boss, and this single-trigger, invented so long ago as 1894, has from time to time been improved. It is only fair to say that, with regard to shot-guns, for a recoil-operated mechanism the Boss system meets the inherent difficulties of the involuntary pull in the most ingenious way. Double discharge from the involuntary pull has always been a difficulty with timed and three-pull mechanisms, and evidently had not been mastered a year ago, as I notice that the inventor of the Boss system was granted a patent dated May 30, 1905, for a mechanical device which I gather from the specification is to obviate this defect.

In the Westley Richards one-trigger mechanism this double discharge through an involuntary pull is eliminated.

Westley Richards give the guarantee that with their one-trigger used on any form of gun or rifle it is absolutely reliable, and will neither discharge both barrels simultaneously nor hang when pulling the trigger to fire the second barrel. To my knowledge this one-trigger for some years has been in successful use upon High Power Express rifles such as the double ·256 Mannlicher, the ·400 and ·450 cordite rifles, and even upon heavy ·577 double rifles shooting 100 grs. cordite and 750 grs. bullet. I believe it is the only mechanism of which it has been said: "The gun will adapt itself to practically every conceivable combination of violence or lightness of recoil and suddenness or complete absence of the involuntary pull . . . conceived with a wonderful ingenuity of purpose" (*vide* the Editor of the *Field's* report, July 5, 1902).

CHAPTER IV

MODERN SHOT-GUNS—*continued*

The Processes of Manufacture and the Gun Complete.

MODERN GUNMAKING consists of a series of highly-specialized trades: barrel-making and boring, action-making, lock-filing, furniture-filing, stocking, and so forth. It is highly advantageous that this should be so, as thus the greatest possible refinement of skill is brought to bear upon each branch of gun manufacture. I will now attempt to describe in sequential order the various processes of gun-building; these, however, are so interwoven that it is somewhat difficult to so present them. The first subject to be taken is that of

THE GUN-BARREL.

A great degree of interest attaches to the calling of "barrel-welder," as the Damascus tube-maker is designated. The iron composed of the required layers of steel and iron he submits to various processes, the carrying out of which has for many generations constituted his industry, this being confined to a small number of master workmen, who have handed down their craft from father to son.

The process of Damascus tube-making comprises several operations. First, the square rod of iron is twisted by a hand machine; this forms an external screw or spiral, and assists in giving that necessary curl or figure to the metal which has caused it to be known by the term "Damascus." The desired number of pieces—two in the case of the two-stripe, three where the barrel is to assume the form known as three-stripe—so screwed are then placed together, heated and hammered flat. These flattened pieces are then welded round a mandrel of suitable shape, and by alternate heating and hammering are forged into a compact tube, the exact external size being given by the shape of the mandrel. The formation of the flats at the breech end are given under the application of the hammer when the tube is placed in dies of corresponding form upon the anvil.

The Damascus barrel, under the skilful and repeated hammering of the barrel-welder, receives a toughness which no machine process is able to give. Of late years tilt-hammering, or a process of welding the barrel by a machine-hammer, has been substituted for the old hand-welding. Excellent barrels are doubtless made by this system, but they have never been able to surpass, and many authorities say to equal, the old reliable Damascus barrels of thirty or forty years ago. In its forged state, as received from the welder, the Damascus tube bears little resemblance to a gun-barrel, and it has to be ground down or turned externally and rough-bored internally before it begins to assume anything like its destined shape.

The manufacture of the steel barrel is much simpler. Generally, the barrel is produced by drilling out short pieces of steel rod, rolling and drawing them under heat to the required length, size, and shape, and then boring them up to the required diameter—a size which will admit of the further necessary enlargement for final finishing. Under this method it will be seen that the hammering process and other special operations required for the Damascus are discarded. In this state it is known as a rough tube, and is ready for the barrel-filer proper. At this stage much skill is requisite to produce so important an adjunct as the perfect gun-barrel—a barrel in which the metal is distributed in proportion duly calculated to bear the strain set up at the various points by the explosion of the cartridge.

The perfect gun-barrel has no "set" in it, that is to say, it must be absolutely straight and be bored true. The setting of the gun-barrel is a very important part of the barrel-maker's calling; by the shadow thrown by a wire or other straight edge on to the interior of the bore, the trained eye can detect any crook however slight, and by a skilful manipulation of the hammer remove such defect. In some manufactories the tubes are set by

Fig. 42.—Process of Welding Damascus Tube.

Fig. 43.—Steel Rod. Fig. 44.—Steel Rod Drilled.

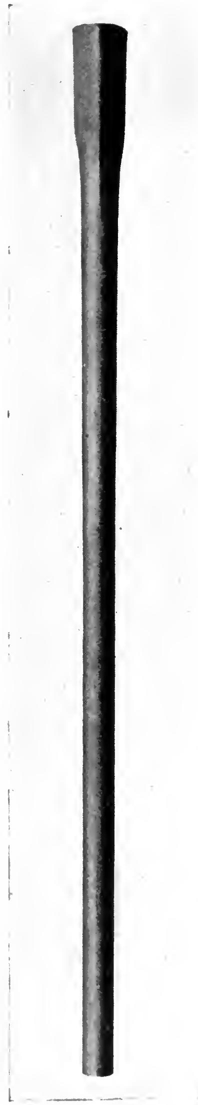


Fig. 45.—Rough Steel Tubes.

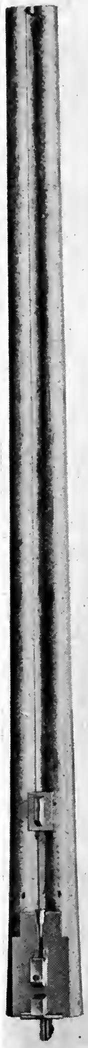


FIG. 47.
BARRELS WITH LUMPS AND RIBS ATTACHED

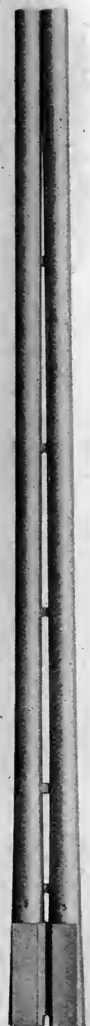


FIG. 46.
TUBES COUPLED.

the aid of machinery, but even in this case the trained eye is required, and I am not aware that any high-class gunmaker has been able as yet to dispense with it.

Many people confuse the rough tube with the barrel. As shown, the making of the rough tube represents a separate calling, and forms no part of the barrel-maker's craft. In fact, in regard to the Damascus tube, welding is an entirely separate calling from that of barrel-grinding and boring, whilst the barrel-filing proper, *i.e.* making the tubes into the important portion of the gun of which they form a part, in itself consists of not a few trades. Here, for instance, is the lump-forger; but these lumps have to be fitted to the barrel by the barrel-filer, who prepares the necessary slots to receive them. The barrel-filer also straightens the tubes, and keeps them during their subsequent processes free from "rivels," "crooks," and other defects which would prejudice the shooting qualities. He has to couple the barrels together, which requires no little skill, also some long practice in the heating of metals and of gauging its effect. Finally, there is the rib-forger, an entirely separate industry. The filing of ribs received from the forger being another portion of the barrel-filer's trade, and finally comes the finish-borer.

Important as the tube-making is as forming the foundation of a sound and reliable barrel, it is far less important from the point of view of skill and the number of processes that are involved in the art of barrel-filing. The best tubes in the world, tubes made of the finest materials possible, unless properly treated by the barrel-filer might be worse than useless. He has to maintain their fundamental good quality under all conditions, but he further has to build up upon these tubes a piece of work which forms one of the chief characteristics of the gun. Without barrels that will successfully stand repeated firing for many years, and do this with consistent and reliable accuracy of shooting, the very best gun mechanism would be valueless.

After setting, the barrel is bored up to the requisite size for statutory provisional proof—the provisional proof-charge for a 12-bore shot-gun being $9\frac{3}{4}$ dr. of black powder, and $1\frac{1}{4}$ oz. of shot. The separate tubes are then finally turned down for coupling together, and are made to receive the lumps for attaching them to the breech-action. They are next joined side by side (see Fig. 46) to a gauge, insuring the proper width at each end, so that both throw their shot to the same mark. The lumps and ribs having been attached to them by soldering or brazing (see Fig. 47), the barrels are advanced another stage in the boring up towards the finishing size, and are then ready to go to the action-filer to have the breech-action fitted. Although in giving these particulars a number of minor operations have not been detailed, a sufficient outline of the various processes will possibly have been given for the sportsman's purpose.

As will have been seen with regard to the barrels, many trades contribute to the building of a gun, in just the same way that several trades are involved in the building of a house, and this fact is further exemplified in the production of the breech-action.

Barrel-jointing.

This is a term used in connection with the fitting of the barrels to the action, in itself a very important and separate trade, a man spending his lifetime at this one job. The lock-filer, for instance, must be a good spring maker, and be able to give just that precise temper which ensures necessary strength and vitality, but he knows nothing of the action-jointer's work, and *vice versâ*.

Barrel-jointing consists, briefly, in forming hooks to fit corresponding recesses within the body; one hook pivoting on a solid joint at the forward end and the other end engaging within the recess towards the rear of the action-body. These hooks, in the highest types of modern gun, fit so closely to the body or breech that it might almost be inferred they had grown together, as even a hair or the thinnest piece of tissue paper would prevent the barrels closing upon the breech. It is upon this accuracy of jointing, combined with sufficient strength of parts, that the gun depends for strength to resist the explosion of the cartridge.

Bolts are employed to engage with the hooks for the purpose of keeping the barrels in position, but bolts without perfect jointing would not long stand the strain of repeated firing. After the barrels are jointed, the lock, on being filed, is fitted into the body or breech-action, after which the furniture-plate with trigger and guard are filed and also fitted.

The introduction of the hammerless system, as we have seen, distinctly marks an epoch in the history of sporting firearms, and owing to the radical change in the form of its breech-action and lock, it brought in its train a need for new methods of manufacture, the establishment of new systems, and the training afresh of men for the production of this novel lock mechanism, the limbs of which presented so wide a difference from those constituting the gun-lock which the skilled filer had hitherto to deal with. And thus it was that, perhaps for the first time in the annals of British gunmaking, the gun manufacturer included in his work the important mechanism of the gun-lock, which had hitherto formed a separate trade. He became his own lock-filer—the majority of gunmakers prior to the introduction of the Anson and Deeley gun buying their finished locks from one or other of the well-known lock-filers.

Conspicuous amongst the latter was the celebrated Brazier, a name which is worthily associated with all that may be best said of a highly-finished gun-lock. Even to this day the name stands as a recommendation, and many gunmakers who still rely upon help of the outside gun-lock filer advertise that for their highest productions they use "Brazier locks."

But great as was the celebrity earned by the beautiful Brazier locks, it is only fair to say that Messrs. Westley Richards, who invented the Anson and Deeley hammerless gun, have for the past thirty years made lock mechanism of such fine and reliable quality, and, what is so very much to the point in these times, of a durability equal to the specially severe calls of modern shooting. It may be stated that this firm's productions have withstood infinitely greater wear than the old Brazier locks ever were subjected to.

Facts and figures indisputably prove that the gun-lock as made by Messrs. Westley Richards stands higher in the estimation of the modern sportsman than those of Brazier did in his day, and that whilst the Anson and Deeley lock is not only simpler and more mechanically sound, it has performed with exceptional satisfaction under the severest stress and strain of modern shooting. This lock has come successfully through an ordeal of wear and tear never contemplated in respect of its predecessors; Messrs. Westley Richards & Co. have in their possession many letters from clients who state that they fire 5000, 10,000, 20,000, 30,000, and even up to 70,000 cartridges per annum from their guns with perfect comfort and absolute certainty. I state these facts in order to support my argument that, now we find the advanced gun constructor of the day giving his attention to the designing and filing of gun-locks, he has excelled everything that had previously been done in that direction.

Proof.

Before they are finished off, the action and barrels have to be submitted to a definite test of proof in accordance with Proof House regulations, and are stamped with the Government Proof marks. This is a matter of equal importance to the shooting public as to the gunmaker. It is the final test of the barrel after it has been reduced in the process of action-fitting and of boring out with a chambering tool to take the cartridge, and it also tries the strength both of the breech-action and of the fitting and adjustment of the barrel bolts.

The provisional proof test, which is applied solely to the barrel or rough tube, is calculated upon three times the service charge of powder and with the service charge of shot, and this charge gives about the same pressure at 1 inch as the definitive proof with a somewhat higher pressure at the forward part of the barrel.

The definitive proof test for a 12-bore shot-gun is $6\frac{1}{2}$ dr. of T.P. black powder and $1\frac{11}{16}$ oz. of shot for a maximum service charge of $3\frac{1}{4}$ dr. of powder and $1\frac{1}{4}$ oz. shot. This charge is calculated to give the following pressure—

One inch from breech, 4·5; at cone, 4·4; and 6 inches from breech, 3·1 tons.

In addition to these two proofs, most guns are now usually submitted to a supplementary test with a charge of treble strong black powder of fine grain, which is based on the service charge of the nitro or smokeless powders now in general use. This test is termed "Nitro Proof," and after guns made of the best material throughout, and of high-class workmanship, have been submitted to these severe ordeals of proof, it will be realized that the greatest care has been taken to guarantee the safety of the public on the one hand and to protect the reputation and interests of the gunmakers on the other.

As compared with the definitive proof pressure, the supplementary or nitro proof at the same distances gives the following pressures respectively—

4·9, 4·5 and 2·5 tons per square inch.

The pressure thus given by the two definitive proofs shows that the definitive black powder proof is lower at the breech than the nitro proof, while the latter is less at 6 inches than the black powder definitive, and this is supposed to show the necessity for the two proofs, but it would be far more consistent to have the gun proved only for a class of powder which it is intended to shoot. By this means the extra stress set up by the additional proof would be obviated. Few guns, and probably none amongst the higher grade weapons sold in this country, are ever used with anything but the smokeless powder, and it is, therefore, obviously unnecessary to prove them for black, but even when all is said, the sole difference in pressure given by the two proofs is too small to become a decisive indication of the margin of safety left. The difference of 1 ton pressure at a point of 6 inches on the average strength of barrel would not constitute a dangerous rise of pressure in such a barrel.

The Stock.

The choice of the gun-stock is a matter calling for the due exercise of a considerable amount of experience. Versatile as are his attainments, the modern constructor of high-class sporting arms can scarcely be expected to have acquired much expert knowledge of forestry or the growth of timber. This forms a separate trade, known as stock-dealing, which in itself does not reach the source of supply, for the dealer himself generally buys the gun-stocks in the plank state from a third person who has bought them in the growth.

A good many walnut stocks come from France, some from Italy, others from Russia, French walnut, however, predominating. Stocks suitable for the higher class of guns are not specially grown, but reach the gunmaker's hands by a process of selection from the thousands bought by the stock-dealer. The latter, for instance, buys a pile of timber containing a great variety of stocks which, as regards their quality and price, may prove suitable for all kinds of guns; from these, by careful selection, he gets together a batch suitable for the high-grade modern gun. But the gunmaker requires to be a good judge of wood, and, indeed, he is probably a better judge of grain than the stock-dealer. What may appear to be a handsome stock to the dealer's eye may be worthless to the gunmaker, and the latter alone knows how to select it for the happy combination of correct growth, good grain, colour and figure, and, of course, weight.

These gun-stocks are generally bought in a state which the gunmaker terms "wet," but which, by the way, the dealer asserts to be "dry." The latter may have kept them a year or two, and it is the custom of most gunmakers to buy ahead for several years. As a rule, it is necessary for the gunmaker to keep the stocks for some years before using them; they are usually placed in a special compartment to insure a gradual and equable drying process. Wood is naturally susceptible to extremes of climate, and yet it is seldom, such is the care exercised, that shrinkage or swelling of the wood is known to occur on a high-class gun.

FIG. 48.—ROUGH SLAB OF WALNUT.

The price of the rough gun-stock, practically a piece of timber of a size capable of being formed into a gun-stock, varies from 25*s.* to £5. On looking at these blocks of wood

FIG. 49.—FINISHED WALNUT STOCK.

in the rough, as here illustrated, any one unaccustomed to the business would not be inclined to value them at more than so many pence. And yet these solid pieces of walnut, when reproduced in the finished gun, frequently present so beautiful a show of colour and perfection of growth, that the high price of the raw material can no longer be marvelled at. The rough stock is next trimmed out, and its suitability as regards growth is then finally determined. If this be confirmed, the necessary parts of the action are let into the wood. The wood is carefully chiselled out, the metal-work being smoked or blacked at each process in order to test, by corresponding impressions upon the wood, whether the bearings are close; this goes on until the metal is finally bedded into position so exactly that both metal and wood seem to be all of one piece. This is a process demanding considerable skill, and, indeed, the interior cutting of the recesses of the stock to receive the iron-work presents an example of fine handicraft, and should rank equally with the external work visible to the eye. The next operation is that termed

Screwing.

This implies the screwing or fitting of the stock with the pins or screws which rigidly secure it to the iron-work. The interior of the stock is next cut away, with the same care as before, to receive the mechanism and the trigger-plate; the butt-plate, or heel and tips, as the case may be, are fitted; the bolt by which the fore-end wood is secured is then let in, and all superfluous wood is taken off to give to the stock further definite shape, thus advancing it another stage towards final development.

Boring and Shooting.

While the previously described process of screwing is being accomplished, the barrels have gone to the fine borer to be polished and regulated for shooting. On this being done, and whilst the stock is in the state described, the gun is ready for shooting. The barrels when submitted to the final proofs just mentioned are within a few thousandths of an inch of their ultimate size. The fine boring consists in itself of two processes, known respectively as "roughing" and "finishing." "Roughing" consists in giving the barrels a suitable size and shape interiorly, preparatory to the final polishing. They are then handed over again to the barrel-filer, who finishes off the outsides, trues up the ribs, and removes all trace of scratches or other slight damage received in their late journeyings. The fine borer then having given them a light polish, they are chambered and the interior of barrels and chamber are adjusted to a measurement so fine as $\frac{1}{1000}$ part of an inch.

Formerly, close and regular patterns were too often only to be obtained after days of retouching, regulating, and so forth, whereas, the gunmaker who now bores to precise dimensions knows that the shooting will conform to certain clearly-defined rules before the gun comes to be shot at the target. But it was also true that the powder and shot, the percussion-cap, wadding, and all the components going to form the complete cartridge were not under such watchful control as they now are. There is no doubt that the variations in pattern which arose from the inconsistency, the inconstant character, of these agents were many, whilst the real cause was unknown to the borer of fifty years ago.

The best borers of that day have been known, after repeated disappointing trials of a barrel bored apparently upon lines that previously had given good results, to give the matter up and put the barrel on one side for a certain period. A well-known gunmaker, whose name is a household word among sportsmen, was accustomed to say that the gun-barrel was incomprehensible; further adding, "It's like a fiddle or a woman, sir." It was found that this barrel, on being shot under different climatic conditions, gave satisfactory results, and it is not an extravagant statement that in those days when the majority of workmen could not read nor write, their ignorance of the causes at work led them into cultivating a superstition respecting the behaviour of gun barrels.

By the light of more recent investigation and scientific knowledge we are aware that probably too much or too little moisture in the powder, a too weak or excessively strong cap, or other defects, or variations in the cartridge, were the sole causes of what was to the barrel-borer of old a mystery not to be unravelled. Of course those causes which affect the accuracy, regularity, and uniformity of the pattern were no doubt assisted by the somewhat greater latitude then permitted in the maximum and minimum internal sizes of the barrel, the gun-chamber, and the cone, as well as in other directions bearing upon the production of the best possible shooting results. In former times one frequently heard sportsmen remark upon the excellent shooting of one barrel and the mediocre performance of the other in some guns—in fact, only one man here and there had really good shooting guns. The exactitude of the methods now employed in barrel-boring insures not merely that all sportsmen may have guns of equal and truly excellent shooting qualities, but that those good shooting properties shall continue long unimpaired. Indeed, it need well be so, for it is a fact that in some hands the modern gun has constantly to endure more shooting in each single year than the weapon of half-a-century ago experienced in its whole lifetime.

An important feature of the chamber, exercising a great effect upon the shooting of the gun, is that part known as the cone or lead. This is that part of the barrel from the end of the cartridge chamber which is eased off into the bore proper, for the purpose of forming an easy passage for the shot.

Our leading gunmakers have for many years bestowed especial care upon the accurate dimensions of the chamber, the cone or lead, and the barrel itself, which have largely contributed to steady and uniform results. It cannot be said, however, that the measurement and other observances of the cartridge-case and ammunition have travelled *pari passu* with those rigid refinements of barrel and chamber gauging practised in recent years in the best gunmaking establishments, or manufacturers have set themselves to produce cartridges within such strict limits of accuracy as to adhere to measurements of $\frac{1}{1000}$ part of an inch.

It has been stated in the sporting press that many gunmakers do not sufficiently realize the importance of adopting a proper series of dimensions for the back end of the barrel. A statement which is altogether inconsistent with my experience of modern high-class gunmaking. Gunmakers who bore their barrels to one-thousandth part of an inch have, for three decades or more, recognized that accuracy in the dimensions of the chamber, both as regards its exact length and diameter, as well as in the cone and lead, has considerable influence in the gun's behaviour at the target, and that the same accuracy and care which they devote to the boring must be given to the other parts of the barrel, which after all in scientific gunnery is only one item of the operation of barrel-boring.

It is inaccurate for any critic to assume that the gunmaker who carefully studies the question of shape and size in respect of the

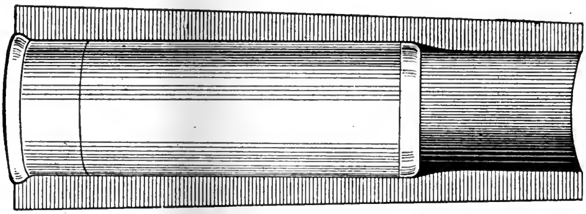


FIG. 50.—SECTION OF WESTLEY RICHARDS 12-GAUGE CONE WITH CARTRIDGE WITHIN THE CHAMBER.

coning of the choke will neglect points of equal importance when they belong to the cone of the chamber.

In Chapter V results of shooting in a series of tests are given of a 12-bore gun, No. 16417. The consistency of its performance

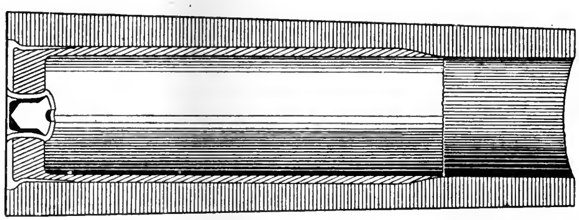


FIG. 51.—SECTION OF WESTLEY RICHARDS 12-GAUGE CONE WITH FIRED CASE SECTIONED WITHIN THE CHAMBER.

may be taken as fairly representative of the standard for which a high-class gunmaker bores his gun. Such gunmaker shoots each individual weapon as I have remarked after previously boring it to one-thousandth of an inch.

It was during a prolonged visit to Messrs. Westley Richards's factory, that I was lead to entertain the idea that target-testing might be superfluous. There I had the opportunity of seeing many guns tested, and it surprised me to find how great a percentage of well-bored guns would pass the shooter's view on the first test at the target for pattern and penetration.

In discussing this matter with the managing director, Mr. Leslie B. Taylor, he stated that a test was not absolutely necessary as he was prepared to show. For this purpose a pair of 12-bore barrels, bearing the number 16244, in the rough-bored state, just as received from proof, was taken from the store. On gauging these, assisted by the barrel-borer, I found they measured as follows :—

Cylinder barrel.	Diameter of bore at breech,	·729 inch.
" "	" " muzzle,	·726 "
Choke barrel.	" " breech,	·729 "
" "	" " muzzle,	·693 "

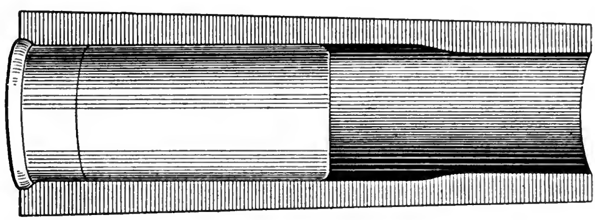


FIG. 52.—SECTION OF WESTLEY RICHARDS 12-GAUGE CONE WITH 2-INCH CARTRIDGE WITHIN THE CHAMBER.

On being shot at the target in this rough state with 42 grs. Amberite and $1\frac{1}{8}$ oz. No. 6 shot, the cylinder barrel made the following pattern on the 30-inch circle at 40 yards: 105, 102, 94, 109, 88—average 99.

There was no shape on the choke of the other barrel, and its rough angular edge absolutely precluded it from being shot before boring.

The barrel-borer was then instructed to bore these barrels to certain measurements: which were written down in his instructions' note—a copy of these internal dimensions being handed to me, Mr. Taylor having first written against each barrel the patterns which he guaranteed they would make, viz., cylinder 140–145; choke 218–225.

On the process of boring being completed, I carefully tested the boring of each barrel with hardened steel cylindrical gauges, and found that the borer had carried out his instructions to the exact dimensions.

The barrels were then shot at the 30-inch circle at 40 yards' range, with 42 grs. of Amberite, and $1\frac{1}{8}$ oz. No. 6 shot, when the following patterns were displayed :—

Cylinder . 148, 154, 138, 145, 147—average 146.
Choke . 221, 213, 203, 223, 219—average 216.

Comment is unnecessary, but it will be seen that the gunmakers' estimate was correct within one pellet in the case of the cylinder barrel, and two pellets in the case of the choke barrel.

Nevertheless, Messrs. Westley Richards informed me that they do not intend to abandon the test of individual guns, as the target trials afford an automatic check upon their borer's efficiency, as well as a test of powder, percussion-cap, and other parts of the cartridge. And further than this, even though the tests might be considered as somewhat unnecessary, they would not be prepared to forego them as it would break their long-time records, their registers of the shooting of individual guns forming a complete record of these tests extending backward for considerably more than fifty years.

In a pamphlet issued by Messrs. Curtis and Harvey, the expert writer states, "The improvement of smokeless powders will proceed hand in hand with a parallel advance, not only in the exactitude of cartridge loading but also in the boring of guns and the proper formation of their chambers." As we have seen, this is not a true estimate of the position.

When this statement is considered, sportsmen will do well to reflect that certain contemporary authorities which have for many years dealt with the technical side of gun and rifle-making have spoken favourably of 2-inch cartridges in $2\frac{1}{2}$-inch chambers, a recommendation that can hardly be said to be an advocacy of "exactitude in the gun having a parallel advance with that of the cartridge."

The same gun, No. 16244, was immediately afterwards tested with short cartridges as follows :—

2-inch unconed Ballistite "Parvo" case.
24 grs. Ballistite powder.
1 thin card, $\frac{7}{16}$ inch felt (best), 1 card, and 1 card over-shot wad.
1 ounce No. 6 chilled shot.

Patterns.

Right barrel, 86 and 64. Both bad cases of balling.
Left barrel, choke, 135 and 141.

The effect, therefore, of using a 2-inch case in a gun carefully chambered for a $2\frac{1}{2}$-inch case, is that it reduces the cylinder pattern by very nearly 50 per cent. and further, brings down the choke pattern to less than the level of a cylinder, a reduction of over 30 per cent.

It is also to be noted that balling resulted in the cylinder barrel, when used with a 2-inch case, while the shot patterns were free from this serious defect when used with the proper length of cartridge-case for which the gun was constructed.

Gunmakers of repute have long recognized the important bearing of the cone or lead upon the production of good shooting and they have given this matter close and serious attention, in the interests of regular and even pattern, and other qualities.

In an ordinary gun chambered for the paper case, the object of the mechanician has been to keep as short as possible that taper portion at the end of the chamber which represents the difference between the external diameter of the cartridge-case, and the size of the barrel, that is, this difference is to lose itself in the shortest possible taper or cone that can be made consistent with an easy passage for the charge.

The practical value of the cone consists in the following :—

1. A complete gas check through the action of the wadding, which, while sufficiently expanding, keeps square during its passage into the bore.

2. Effecting this with a minimum mutilation of the shot, in order to avoid leading, and at the same time to retain the highest capacity of flight for each individual pellet.

3. By this means, in an otherwise well-bored barrel to preserve the highest possible penetration coupled with uniform and well distributed patterns.

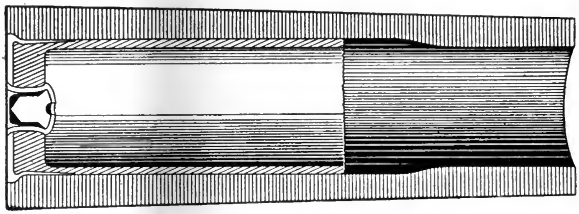


FIG. 53.—WESTLEY RICHARDS 12-GAUGE CONE WITH 2-INCH FIRED CASE SECTIONED WITHIN THE CHAMBER.

The long taper cone tends to produce the evils of leading; unequal patterns, and increased recoil resulting therefrom.

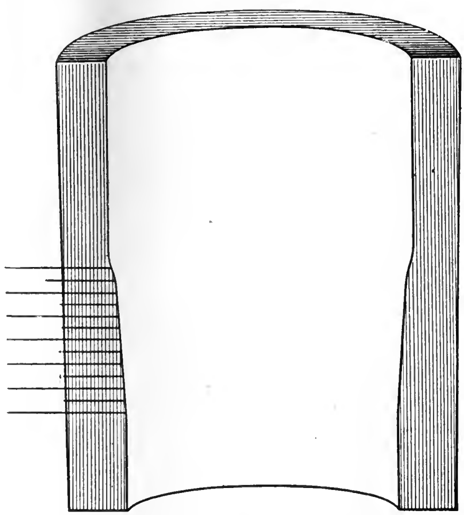


FIG. 54.—SECTION OF WESTLEY RICHARDS 12-GAUGE CONE.

Gunmakers and experts have for years condemned first the long cone, and second the use of the $2\frac{9}{16}$-inch cases in $2\frac{3}{4}$-inch chambers; and for the same reason the 2-inch cartridge is condemned for promiscuous use in any and all kinds of chambers bored for the $2\frac{9}{16}$-inch cartridge; not merely on the grounds of being unmechanical, but as reducing the patterns, impoverishing the effectiveness of the shot, and by inducing leading and balling. The former may be dangerous to the gun, the latter to other shooters in the field.

I here illustrate the Westley Richards chamber-cone, Fig. 54, which they have used for many years, and is that adopted in the many guns I have tested including those referred to in this work. It will be seen that at one point just in front of the cartridge-case it is slightly "ogee" in form.

It may be an ideal, but surely it is not too much to hope that the powder, the percussion-cap, and the whole structure of the cartridge, may in time be brought under the same control, and reach the same degree of accuracy, which the high-class modern gunmaker is enabled to insure in his weapons, and when this comes about, both gun and cartridge will equally contribute to the realization of a perfect combination in gunnery.

Having reached the required standard of excellence, the gun is then passed on for finishing.

Stock-finishing.

The stock is next submitted to a process of wetting and drying over a flame, smoothing off with a rough file, of again wetting and drying, and of finishing off with a fine file. It is then again wetted and dried, and gone over with a bastard file to get it into further shape. Still another process of wetting and drying follows, when the stock is finally formed into shape with a tool termed a "smooth." It is then papered off with three kinds of glass paper of diminishing roughness, and between each papering is again wetted and dried over the flame. This raises the grain of the wood, and results in a perfectly smooth surface.

A coating of a special preparation is then applied, this serving to fill the grain of the wood, and, alternating between repeated cleanings of the surface, these applications are continued until the grain is completely filled up. Whilst the ordinary gun-stock requires four of these processes, others may need six or even more. Next is put on the necessary chequer upon the hand or grasp of the stock and upon the fore-end, this forming a diagonal pattern of crossed lines, which is pleasing to the eye and serves the useful purpose of steadying the shooter's grip.

Fig. 55.—Cover-plate.

Linseed oil is then applied, repeated coats being given over a space of two days or so. The gun-stock, treated by a succession of such careful processes, is enabled to resist the inroads of moisture, as well as the extremes of temperature, and, if properly looked after and cared for by the sportsman, it will preserve its aspect and fine polish for many years. This is termed an oil-finish, the resultant fine surface being obtainable only by a lavish application of that commodity known as "elbow-grease."

The body of the action, the limbs, springs and pins are next carefully polished. The great art of polishing consists in giving the requisite bright surface free from all blemish, and at the same time preserving the squareness of edge, so that the fitting of each part will not be disturbed.

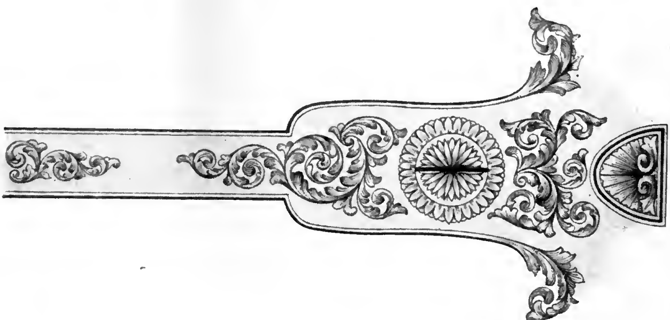


Fig. 56.—Engraving on Westley Richards Muzzle-Loader Half-a-Century Old.

Engraving and Naming.

Most guns have a moderate amount of engraving, but of course sportsmen vary somewhat in their tastes in this direction. Some prefer to have a practically plain weapon, simply bearing the name of the maker either upon barrels and action, or, possibly,

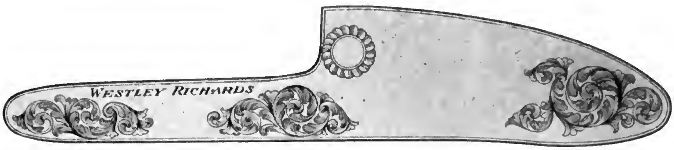


FIG. 57.—MUZZLE-LOADING LOCK ENGRAVING OF FIFTY YEARS AGO.

with the name gold-inlaid upon the sides of the body. Those who prefer a gun without engraving rely upon its severe yet elegant lines for the gratification of their taste. On the other

FIG. 58.—TYPE OF MODERN ENGLISH GUN ENGRAVING.

hand, many sportsmen of taste prefer that the lines of the gun should be toned down by a plentiful addition of engraving.

When this is so, the gunmaker applies the engraving in the most artistic way to suit the lines of the gun. Given a taste for artistic ornamentation on the part of the patron, the gunmaker can satisfy him with work of the highest merit, even to the extent of an expenditure of £20 or £30 in addition to the price of the gun; this, too, without any of that gold incrustation which frequently finds favour especially with Oriental sportsmen. Much might be said upon the subject of gun engraving and ornamentation. English taste from the earliest period seems to have conceded the necessity of some decoration, although sparsely applied in puritanical scrolls.

Joe Manton's and other well-known guns of that period just

FIG. 59.—TYPE OF MODERN ENGLISH GUN ENGRAVING.

express this rigid view. Continental weapons, especially those of Italy and Germany, on the other hand, were profusely decorated; ornate curving of the stock, lock, and barrel running riot in a florid treatment of familiar subjects of classical mythology.

I think it will be admitted that modern English guns are of a more ornamental character than their predecessors of half-a-century ago; doubtless, the demand for external artistic finish on the part of the sportsman has stimulated effort and brought about a higher type of engraving.

Each gunmaker of standing, I believe, has studied the subject of engraving in respect to the form, outline, and structure of the particular model of gun he affects; so that the engraving is often just as expressive of his individuality or character as is the "build" of the gun.

Some gunmakers place upon their weapons a fine and delicate scroll engraving whose merit is only apparent by close scrutiny; others deck out their guns with a bold and flowing scroll, deep cut, and at once apparent, and we get many varieties of each type.

Fig. 60.—A Plain Gun.

There always will be two schools—each containing subsidiary sections—upon the question of taste. The severely plain man at one end and the man avaricious for a wealth of ornamentation at the other. But *de gustibus*—we know there is no finality—no one is ever right, or ever will be.

Given a plain gun expressly designed and constructed to be severe, cold, and innocent of the smallest ornament, it, nevertheless, should have a beauty of outline and proportion, for lacking which it would be a mere lump of iron and wood. In short, a gun without engraving—that still appeals to the connoisseur—in order to stand his critical appraisement, must be of the first order in mechanical design, construction, and contour. But, on the other hand, the taste that naturally flows to ornateness wants to know why perfect outline and graceful proportion should not receive the additional attraction of tasteful and well-executed decoration.

For sound and tasteful work modern English guns cannot be beaten. I am not so sure—and neither insular prejudice nor patriotism are recognized in the republic of art—but I think the continental gun engravers are the better artists.

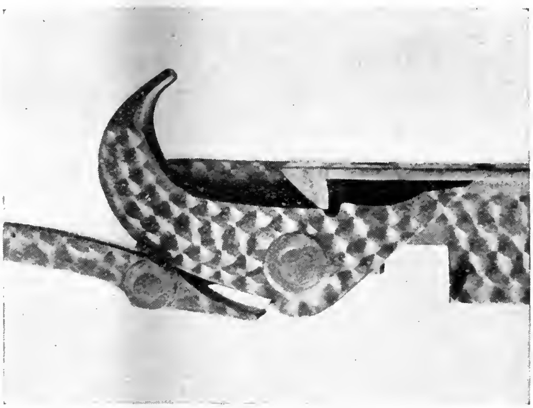


Fig. 61.—Illustrating Sear Nose and Tumbler Bent, together constituting the Pull-off.

Blacking, Freeing and Finishing.

By the aid of acids, and the process of steaming and drying, steel barrels are given a coating of black colour. This gives a finish to the barrels, deadens down their aggressively bright and glaring appearance, and preserves their external surfaces from rust. The gun is now practically completed except for the final freeing of the parts.

After the prccesses of hardening and barrel-blacking, the fitting parts of the action and barrels require cleaning up, so as

TYPES OF MODERN ENGLISH GUN ENGRAVING.

To face page 88.

to readjust them to their original bearings. This involves very delicate treatment, for the workman or viewer must see that all the parts, while fitting closely, work smoothly and efficiently. There is no part of the gun requiring more careful adjustment, to insure accuracy of shooting in the field, than the trigger-pulls.

The nicety of the pulls depends in a very large measure upon the bearing surfaces of the different parts having the same degree of hardness and temper to insure regularity. The exact amount of pull-off required by individual shooters can be regulated to the finest point by a workman specially qualified for this important purpose, who can so adjust the pull-off that it will weigh within a few ounces and give the same weight each time in a given number of shots. A most important matter this, for nothing so contributes to the sportsman's success as a reliable trigger-pull, which enables him to fire the gun at the crucial moment, not sooner and not later. Whether the pull is very fine to suit a delicate touch, and weighs only, as in some guns, 1½ lb., or whether it goes to the other extreme and weighs 5 lb. or 6 lb., the important factor, as insuring success in the field, is regularity.

The Complete Gun.

It may have come as a surprise thus to learn of the many processes involved in the construction of the first-class modern sporting gun.

In buying a truly high-class gun the sportsman gets, amongst other things, the following advantages, not all of which the purchaser of the lower-priced gun can reasonably expect to obtain—

1. Highest development of inventive genius and of skill in gun construction.
2. Evenly distributed shot-patterns, coupled with the highest possible penetration.
3. Strength at a minimum weight and endurance.
4. The safety and reliability of the mechanism.
5. Just balance.
6. Graceful proportion.

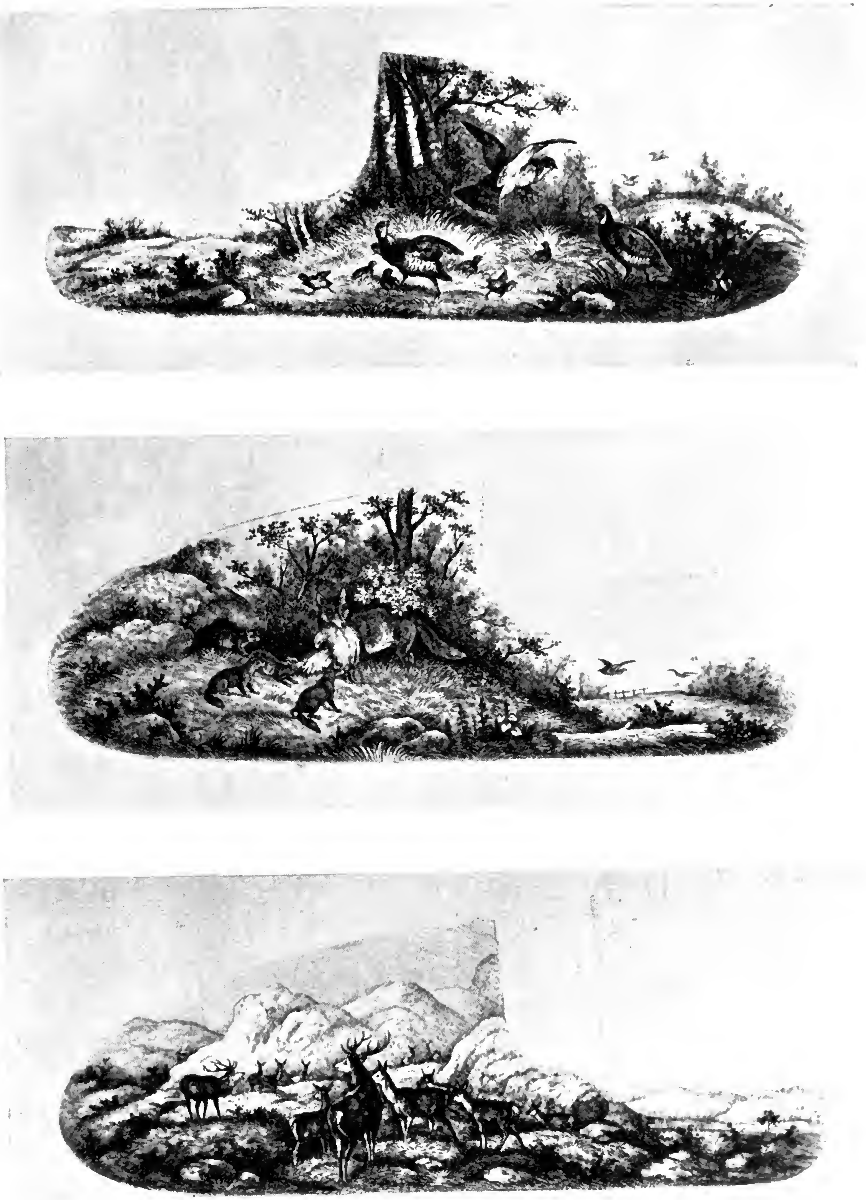
Taking these seriatim, we first have the benefit of the brains of men of trained capacity, and sometimes of genius; men who invented such important improvements as the treble-bolted top-lever extension rib fastening, the hammerless hand-detachable lock, the snap fore-end, the ejector, and a thoroughly reliable one-trigger mechanism and good shooting qualities; and, next we have the first-class craftsmanship to carry out in the most thoroughly efficient manner all these ideas.

Then we get the least possible amount of substance and weight in barrels, action, and all parts, compatible with the attainment of the greatest degree of solidity. It is requisite in modern gunnery that there shall be a sufficient margin of strength in all parts to insure against all possible risk of accident, in the form of broken actions or burst barrels. This, by reason of the fact that, as already remarked, a gun is now called upon to do ten times more work than the hardest worked guns of our grandfathers ever performed. Also, that the varying pressures and strains set up by the multitude of new explosives, demand ample reserve of strength to secure the personal safety of the shooter.

The reliability of the working parts ranks next in importance to the previous consideration as an essential qualification. In fact, the two are practically identical considerations, in so far as safety is concerned, for it requires no stretch of the imagination to picture a situation where the gunner's safety may be imperilled by a breakdown of the mechanism, as, for instance, when facing dangerous big game. Or again, through the breaking of a lock or through some defection in a safety-bolt, danger may lurk, either to the shooter or to his fellows.

But apart from considerations of bodily danger, the absolute freedom of movement and smoothness in working of the gun's mechanism should be assured on the score of utility. Even a slight variation from the normal pull-off, failure of the lockwork or of the ejecting mechanism, or difficulty experienced in opening or closing the gun, will cause trouble and loss of sport when grouse, pheasants or partridges are streaming overhead.

Just balance in a gun is essential to perfect success in the field. To be handled with due promptitude and precision, and to insure the sportsman shooting up to his proper form, and doing the best that



TYPES OF BELGIAN GUN ENGRAVING.

(By kind permission of *The County Gentleman* and *Land and Water.*)

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TYPES OF FRENCH GUN ENGRAVING.

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is in him, the gun should come up readily, and so well and easily that it seems as though the merest perceptible effort was requisite to instantly place it in position for firing. Of course, to kill with it at all readily the gun must fit when at the shoulder, but it is not the fit I wish to speak of just now—that will be dealt with in a subsequent chapter.

The truly high-class gun, the masterpiece in gun construction, can be detected with the eyes shut. The shooter of discernment, the shooter with a keen sense of the general fitness and beauty of things, will understand me when I say there is a certain buoyancy, and altogether indefinable combination of lightness and handiness about the really well-balanced shot-gun, which is only uniformly assured in the higher grades. In hand, this sort of gun never feels to be its true weight, whereas the clumsily-constituted and ill-balanced gun always proves a drag upon the arms, and its weight is only too apparent.

Finally, the graceful proportions of the truly high-class gun are patent to all having half an eye for beauty of form and elegance of design. Its symmetry and general harmony of lineal contour at once lift it out of the common rut, and place it in a class where it may have compeers, but no superiors.

Such a gun as this is designed and shaped by eye and hand alone, its form and lines are neither mechanical nor geometric. They can only rightfully be described as artistic, and the machine is not yet invented, neither is it likely to be, that will produce guns having true balance, elegant form, and graceful proportions such as these possess.

True mechanical principles exclude all superfluous material and rely for strength upon a rational distribution of the various component parts, whose weight is nicely calculated to meet the demands of continuous use and wear. Thus, to sum up, are obtained minimum weight, compatible with safety and the due absorption of recoil, perfect balance, and that grace of form which is attendant upon just proportion.

CHAPTER V

MODERN SHOT-GUNS—*continued*

Sizes, Lengths, Weights and Charges—Boring—Shooting Power and Performances—Pattern—Penetration and Recoil.

THE SHOT-GUN is a term comprising many shapes, sizes and varieties. The huge punt gun of 2-inch bore, discharging at one blast $2\frac{1}{2}$ lb. of shot, and the ·410-bore carrying but $\frac{3}{8}$ oz. of shot, are both qualified to rank under the heading. Shot-guns pure and simple broadly may be divided into the two main classes—game guns and wildfowl guns. There is, however, an intermediary class, the "pigeon gun," which is usually a heavy 12-bore, chambered for $2\frac{3}{4}$-inch, or possibly, in some instances, for 3-inch cases. In England, and on the European continent, this gun is used, as its name in a measure indicates, for the shooting of live pigeons from the trap. To this type of gun the term "wild game" or "light duck gun" would be equally applicable, for, speaking from personal experience, it is an extremely handy gun for either purpose.

Sportsmen have frequently been puzzled regarding the numerals 10, 12, 16 and so on used to indicate the bore of shot-guns. These figures assumed their value in the period long antecedent to the introduction of the micrometer, and other measuring instruments having extreme delicacy of adjustment. On the need for some fixed term indicative of size of bore becoming apparent, the simple expedient was resorted to of terming that smooth-bore gun a No. 12 into which would fit a spherical lead bullet weighing 12 to the pound, a No. 16 that into which a bullet weighing 1 oz., or

16 to the pound would go, and so on. After serving their purpose for a century or so, these rough-and-ready denominations still cling to the shot-gun. They, however, afford in themselves no indication of gauge, and as in recent years the boring of gun-barrels is conducted on measurements so fine as one-thousandth part of an inch, it becomes necessary to fix a more definite measurement than these simple denominators. As the old numerals could not well be discarded, the diameters were accurately determined from the respective sizes of spherical bullets cast from lead of a specific gravity of 11·352. In this way the true gauge of the nominal 10-bore was fixed at ·775 inch, the 12-bore at ·729 inch, the 16-bore at ·662 inch, and so on. In the accompanying table will be found columns of figures giving the diameter of bore in decimal parts of an inch, the nominal size of cartridge or bore, as marked on the barrel at proof, the service charges, and weights suitable for guns carrying those charges.

GAME GUNS.

Bore.		Barrel length.	Weight.	Powder charge.		Shot load.
Actual.	Nominal.			Black.	Bulk nitro.	
in.		in.	lb.	dr.	grs.	oz.
·775	10	30	$7\frac{1}{2}$	$3\frac{3}{4}$	52	$1\frac{3}{8}$
”	10	30	7	$3\frac{1}{2}$	49	$1\frac{1}{4}$
·729	12	30	$6\frac{3}{4}$	3	42	$1\frac{1}{8}$
”	12	30 or 28	$6\frac{1}{2}$	$2\frac{7}{8}$	40	$1\frac{1}{16}$
”	12	28 or 27	$6\frac{1}{4}$	$2\frac{3}{4}$	38	1
·662	16	30	$6\frac{1}{4}$	$2\frac{3}{4}$	38	1
”	16	28	6	$2\frac{3}{4}$	38	$\frac{7}{8}$
”	16	26	$5\frac{3}{4}$	$2\frac{5}{8}$	36	$\frac{7}{8}$
·615	20	28	$5\frac{1}{2}$	$2\frac{1}{2}$	35	$\frac{7}{8}$
”	20	26	$5\frac{1}{4}$	$2\frac{1}{4}$	32	$\frac{3}{4}$
·550	28	27 or 26	$4\frac{1}{2}$	$1\frac{3}{4}$	22	$\frac{1}{2}$ to $\frac{5}{8}$
·502	32	24	$3\frac{1}{2}$	$1\frac{1}{8}$	16	$\frac{1}{2}$
·410	·410	22	3	1	14	$\frac{3}{8}$

The term “bulk nitro” must be taken to apply to Schultze, Amberite, and Kynoch's Smokeless, known as "K. S." For suitable loads of 33-grain, and condensed nitros, the reader is referred to the chapter on "Shot-gun Ammunition."

Barrel lengths and weights vary slightly, but those in the table may be taken as about the best, relatively. Some sportsmen may demur on seeing the 10-bore included under this heading, as so many look upon 12 as the largest bore permissible for game shooting. Still, now and again one comes across a good sportsman having the courage of his convictions, who uses a 10-bore in spite of popular opinion, and for this reason I have thought it best to give a couple of examples of the lighter form of 10-bore used for game shooting. For sportsmen getting on in years, and who, consequently, are not so quick as heretofore, the slightly wider killing circle of the 10-bore may prove advantageous.

Very rarely indeed do we now come across guns of 14-bore, ·693 inch, and gunmakers do not make guns of this, nor of 24-bore, ·579 inch, or other unusual size, unless specially requested. The last-named size would appear to be a favourite with South American sportsmen, for Messrs. Westley Richards inform me they have built a quantity for that country. Mention made of diminutive arms like the 32-bore and the ·410 under this heading will be calculated to raise a smile on many faces. Probably few sportsmen would now think of starting in quest of game armed only with a 32-bore, or a ·410, as thus they would consider themselves handicapped with greatest severity, both in point of range and width of the killing circle of the shot whilst shooting in competition with those of their companions carrying much larger and more powerful weapons.

Pigeon Guns.

Bore.	Barrel length.	Weight.	Powder charge.		Shot load.
			Black.	Bulk nitro.	
	in.	lb.	dr.	grs.	oz.
12	30	$7\frac{3}{4}$	4	56	$1\frac{1}{4}$
12	30	$7\frac{1}{4}$	$3\frac{1}{2}$	49	$1\frac{1}{4}$

In most quarters the shooting of live pigeons from the trap is governed by rules issued by the London Gun Club and the late Hurlingham Club, which restrict the shot load to $1\frac{1}{4}$ oz.

Wildfowl Guns.

The consideration of wildfowl guns necessitates drawing distinction between those guns fired from the shoulder and those too heavy to be so used, which are termed "punt guns." Of these I will first take the

Shoulder Duck Guns.

Bore.		Barrel length.	Weight.	Powder charge. Black.	Powder charge. Bulk nitro.	Shot load.
in.		in.	lb.	dr.	grs.	oz.
—	2	Single, 40	20	$13\frac{1}{2}$ to 15	Not recommended.	$4\frac{1}{2}$ to 5
·935	4	Double, 34	15	$8\frac{1}{2}$	120 to 130	3
"	4	Single, 36	18	$10\frac{1}{2}$ to 12	130 to 152	$3\frac{1}{2}$ to 4
"	4	" 34	12	$8\frac{3}{4}$	115	3
·835	8	Double, 34	$13\frac{1}{2}$	$8\frac{1}{2}$	104	$2\frac{3}{4}$
"	8	" 32	$11\frac{1}{2}$	7	95	$2\frac{1}{2}$
"	8	Single, 34	13	$8\frac{1}{2}$	115	3
"	8	" 32	11	8	112	$2\frac{1}{2}$
·775	10	Double, 32	$10\frac{1}{2}$	5	70	2
"	10	" 30	$8\frac{1}{2}$ to 9	$4\frac{1}{2}$	62	$1\frac{5}{8}$
"	10	Single, 32	9 to 10	$5\frac{1}{2}$	75	2
·729	12	Double, 30	$7\frac{3}{4}$	4	58	$1\frac{1}{2}$

There are infinite variations from the above weights, barrel lengths and charges, but these figures will suffice as an approximate and reliable guide to those interested in wildfowl shooting.

Single Punt Guns.

Bore.	Barrel length.	Weight.	Powder charge.	Shot load.
in.	in.	lb.		
$1\frac{1}{8}$	60	30	18 to 21 dr.	6 to 7 oz.
$1\frac{1}{8}$	80	60 to 80	2 to $2\frac{3}{8}$ oz.	10 oz. to $\frac{3}{4}$ lb.
$1\frac{1}{4}$	90	90 to 100	3 oz.	1 lb.
$1\frac{3}{8}$	96	120	4 oz.	$1\frac{1}{4}$ lb.
$1\frac{1}{2}$	100	140 to 150	5 oz.	25 oz.
$1\frac{3}{4}$	102	160 to 170	$5\frac{1}{2}$ oz.	$1\frac{3}{4}$ lb.
2	112	190 to 200	6 to 7 oz.	2 to $2\frac{1}{2}$ lb.

I give this last table on the score that in isolated cases it might prove useful once in a lifetime, and also for the reason that probably not one gunmaker in twenty could, off-hand, supply these details.

Boring : Cylinder and Choke.

The form in which the barrel is bored regulates to a remarkable extent the flight of the shot pellets. It both controls the initial stage of their passage within the barrel and their subsequent behaviour. It may therefore be well to offer here a few remarks on the various styles of barrel-boring practised by gunmakers during recent years.

Broadly, these styles may be divided into two main classes: cylinder or non-choke, and choke. Each class comprises many varieties of boring. The first term, whilst slightly inaccurate, few gun-barrels being truly cylindrical in bore, is conveniently applied to barrels practically chokeless. It is sufficiently elastic to include all forms of relief boring: *e. g.* the barrel which is of normal width for some distance in front of the cartridge-chamber, and is relieved, or slightly opened, towards the muzzle; also the barrel opened behind, *i. e.* slightly wider at the breech, of normal diameter in the middle, and either contracted or opened a little forward—in fact, all barrels that are not perceptibly nor sharply constricted in some part of their bore come under the definition cylinder.

Under the term "choke" may be conveniently included those forms of barrel-boring in which there is constriction more or less sudden and positively defined. The terms usually applied to the various grades or forms of constriction ordinarily met with are given in the accompanying table, as also the patterns they may be expected to give on the target.

Form or Style of Boring.

1. Old cylinder, using caps, powder, etc., of its time, with $1\frac{1}{8}$ oz. No. 6 shot in 12-bore will give patterns on 30-inch circle at 40 yards of	110–120
2. Modern cylinder and ammunition (ditto) .	130–140
3. Modified choke (ditto)	160–180
4. Full choke (ditto)	200–220

These may appear somewhat lax terms, for they convey no intimation relative to the amount or extent of constriction or choke. This, indeed, is a matter of some difficulty, seeing that there are variations in the form of choke and its precise position within the barrel. For instance, one form of choke may have abrupt, another sloping shoulders; one may be situated at or immediately upon the muzzle, another may be placed an inch or more therefrom, and have the barrel thence for some little distance towards the breech considerably relieved in order to secure greater constrictive effect without offering undue violence to the shot.

Assuming, however, that the barrel is practically a cylinder from breech up to the choke, a constriction at the muzzle of two- or three-thousandths of an inch may be expected to produce the 12-bore pattern of about 140 as above given; whilst twenty to thirty thousandths of an inch in a 12-bore might be expected to give, approximately, the full choke patterns of 220.

There was at one time another form of choke, termed variously "tulip" and "recess." This, I believe, was in great measure called into being at the commencement of the era of choke-boring. At that time there was a considerable demand on the part of sportsmen to have their cylinder guns rebored into some semblance of choke. I, too, was bitten with the mania for close shooting, so sent up one of my guns to be choked. It came back with a length of two inches, more or less, of the bore of the barrels enlarged just inside the muzzle. With regard to the shooting of this gun there was not any very pronounced improvement manifested, and this, perhaps, is not to be wondered at, seeing that any slight tendency to throw the shot pellets together that this form of choking exhibited would be nullified by the rush of powder gases past the wadding during passage over the recess. This, at least, is the theoretical construction I put upon my failure to get really consistent results out of the barrels so choked, and it was not until I had a new pair of full-choked barrels fitted to that gun that I first realized the benefits conferred by a proper system of choke-boring in all forms of long-range shooting.

Information relative to the most suitable forms of boring, cylinder, modified, or full choke, as also the best charges and sizes of shot to use, will be found in the chapters devoted to game and wildfowl shooting. The above treats of the bore proper of the gun-barrel; with many sportsmen that is the principal consideration. But as we have seen, the cartridge-chamber, its length and size, and the form of the cone leading from it into the bore proper vitally affect both the safety and the good-shooting properties of the breech-loading shot-gun.

Shooting Power and Performance.

To ascertain the shooting qualities and killing range of his gun has ever been a subject of considerable interest to the average sportsman. The shot-pattern, its number and distribution, receives the largest attention from the amateur investigator. However, there are other considerations relative to a gun's behaviour upon discharge which bear with more or less directness upon its successful usage in the field. Chief among these are penetration of the shot and recoil of the gun, and these will be mentioned subsequently. We will therefore first take up the subject of

Pattern.

As doubtless many of my readers are aware, pattern, as here applied, is that ocular demonstration of the shooting of the shot-gun afforded by the display of pellet marks upon a whitewashed iron target. Pattern is the primary consideration, for it is a truism that to kill we must hit, and it is equally certain that we cannot well hit without a fair and equable distribution of the shot pellets during flight.

In former times gunners shot at targets of such size as came handiest at the moment, or which suited individual caprice or fancy. Thus, possibly, one target would be a foot square, another might be of circular form and have a superficial area twice the extent of the former; the more to confuse matters, whilst one gunner would carry out his tests at 50 yards, his neighbour might consider a range of 30 yards amply sufficient for his requirements.

This haphazard method afforded no reliable data for purposes of comparison, and left each shooter ever in doubt as to his precise position. Now all this is altered.

Thanks in great measure to the efforts of the *Field* newspaper and others, extended over many years, we now have fixed standards for testing the performances of shot-guns. This constitutes a service of enormous value to both sportsman and gunmaker, as the records obtainable by these fixed methods afford accurate means for comparing the shooting of one gun with another. Before dealing with the performance of the twentieth-century shot-gun it may prove interesting to give the recent actual shooting of two early nineteenth-century flint-guns, shot after many years' wear.

1. An old Westley Richards double 20-gauge flint-lock gun.
   Charge, 2 dr. No. 2 black powder, $\frac{7}{8}$ oz. No. 6 shot.
   Range, 40 yards.
   Target, 30-inch circle.
   Right barrel: 76, 100, 102, 89, 98—average, 93.
   Left barrel: 117, 72, 94, 96, 107—average, 97.

2. A single-barrel flint-lock gun of 12-bore, by the same maker.
   Charge, 3 dr. No. 4 black powder, $1\frac{1}{8}$ oz. No. 6 shot.
   Range, 40 yards.
   Target, 30-inch circle.
   Patterns: 114, 97, 116, 104, 100, 120—average, 108.

Sportsmen not conversant with the precise methods practised in testing the shooting qualities of the shot-gun may frequently have been puzzled on hearing their gunmaker, or, possibly, their fellow-sportsmen in the field, speak of "pattern 130," "pattern 200," and so forth, as terms definitive of the value of a gun's shooting.

In all probability fully 90 per cent. of the guns used for game shooting in this country are of 12 calibre. For the 12-bore gun of good serviceable weight, say 6 lb. 8 oz. to 6 lb. 10 oz., the following are the standards adopted for ascertaining its patterning properties—

Range, 40 yards.

Target, a circle of 30 inches diameter marked upon an iron or steel plate 6 feet square.

Powder charge, 3 dr. of No. 3 or 4 grain Curtis and Harvey's black powder or the equivalent weight of a nitro compound.

Shot charge, $1\frac{1}{8}$ oz. of No. 6 shot (chilled for choice), counting 270 pellets to the ounce.

For the testing of 16 bores and 20 bores these conditions hold as to range and target, charges proportionate to the bore and weight of gun being employed. It will, therefore, be seen that those glib phrases, pattern this or that, so commonly heard in shooting circles, convey the information that the average patterns displayed by the pellets of a charge of No. 6 shot number 130, 200 and so on, within the 30-inch circle when fired over a range of 40 yards. Thus these standard conditions comprise the basis whence all estimates relative to the performance of the game gun are drawn.

Whilst this 40-yards range displays to practical advantage the shooting of a game gun at its full effective capacity with No. 6 shot, it would still be erroneous to infer that 40 yards represents the killing limit of well-bored guns shooting larger sizes of shot. As a matter of fact, we find 12 bores doing thoroughly effective work at 45 or 50 yards upon hares, pheasants, partridges, and grouse, with shot two or three sizes larger than No. 6. Still, a fixed range had to be decided upon for the purpose of gun-testing, and expert opinion finally selected 40 yards as the standard.

Naturally, there are shooters of an inquiring turn of mind who are not altogether content with information gained solely by shooting over this distance of 40 yards. They desire to know what is the actual performance of ordinary game guns at both shorter and longer ranges. This is a very natural desire, having regard to the consideration that game is not killed at the absolute and fixed range of 40 yards, but is killed at all distances between 15 and 50 yards. The following results of various trials of several different game loads at distances ranging from 15 to 50 yards may prove of real service to the sportsman. The figures given are not taken upon calculated properties, as is sometimes done, but each set gives the results of actual shooting.

CONDITIONS OF TRIAL WITH FULL GAME CHARGE.

GUN . . .	A Westley Richards one-trigger double 12-gauge, No. 16417 ; right barrel cylinder, left barrel fairly full choke ; weight, 6 lb. 7 oz.
POWDER CHARGE	42 grains of a standard bulk nitro.
SHOT CHARGE .	$1\frac{1}{8}$ oz. of sizes 4, $4\frac{1}{2}$, 5, $5\frac{1}{2}$, 6, and 7.
TARGET . .	A circle 30 inches in diameter marked on a plate 4 feet square.
RANGES . .	15, 20, 25, 30, 35, 40, 45, and 50 yards.

15 YARDS RANGE.

CYLINDER . .	The full charge was placed within a circle of from 10 to 12 inches diameter.
CHOKE . .	Full charge placed within a circle of from 6 to 8 inches diameter.

20 YARDS RANGE.

CYLINDER . .	Full charge within the 30-inch circle.
CHOKE . .	Full charge within a 12-inch circle.

It was impossible to count any of the patterns made at the above short ranges, the pellet marks being so close together.

25 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder . 170, 172, 163, 178, 171—Average, 170.
Choke . . 183, 189, 186, 190, 187—Average, 187.

No. 4½ Shot, 224 Pellets to the Charge.

Cylinder . 188, 188, 179, 181, 184—Average, 184.
Choke . . 206, 204, 211, 205, 207—Average, 206.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder . 208, 213, 210, 208, 217—Average, 211.
Choke . . 237, 225, 220, 228, 235—Average, 229.

No. 5½ Shot, 270 Pellets to the Charge.

Cylinder . 210, 227, 220, 212, 220—Average, 217.
Choke . . 258, 260, 257, 263, 261—Average, 259.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder . 247, 236, 262, 233, 240—Average, 243.
Choke . . 287, 296, 285, 282, 293—Average, 288.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder . 312, 317, 325, 332, 320—Average, 321.
Choke . . 357, 362, 368, 354, 360—Average, 360.

30 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder . 156, 150, 147, 154, 160—Average, 153.
Choke . . 180, 175, 172, 181, 178—Average, 177.

No. 4½ Shot, 224 Pellets to the Charge.

Cylinder . 152, 149, 154, 159, 155—Average, 153.
Choke . . 199, 195, 201, 195, 196—Average, 197.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder .	180, 183, 180, 185, 188—Average, 183.
Choke . .	220, 227, 216, 230, 225—Average, 223.

No. 5½ Shot, 270 Pellets to the Charge.

Cylinder .	200, 185, 188, 190, 194—Average, 191.
Choke . .	234, 232, 246, 235, 238—Average, 237.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder .	220, 213, 210, 227, 216—Average, 217.
Choke . .	254, 270, 262, 255, 260—Average, 260.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder .	275, 270, 292, 274, 270—Average, 276.
Choke . .	340, 343, 337, 350, 345—Average, 343.

35 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder .	132, 125, 137, 123, 130—Average, 129.
Choke . .	165, 154, 168, 173, 170—Average, 166.

No. 4½ Shot, 224 Pellets to the Charge.

Cylinder .	116, 146, 129, 126, 150—Average, 133.
Choke . .	188, 181, 195, 191, 190—Average, 189.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder .	162, 167, 154, 160, 157—Average, 160.
Choke . .	288, 196, 200, 208, 210—Average, 206.

No. 5½ Shot, 270 Pellets to the Charge.

Cylinder .	175, 158, 160, 156, 157—Average, 161.
Choke . .	232, 218, 212, 216, 220—Average, 219.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder .	160, 172, 165, 183, 173—Average, 170.
Choke . .	227, 250, 238, 252, 247—Average, 242.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder .	200, 218, 227, 216, 230—Average, 218.
Choke . .	326, 305, 308, 312, 317—Average, 313.

40 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder .	105, 100, 102, 108, 110—Average, 105.
Choke . .	138, 132, 140, 152, 143—Average, 141.

No. 4½ Shot, 224 Pellets to the Charge.

Cylinder .	110, 137, 112, 110, 133—Average, 120.
Choke . .	178, 170, 170, 168, 173—Average, 171.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder .	121, 125, 118, 127, 120—Average, 122.
Choke . .	170, 164, 168, 173, 185—Average, 172.

No. 5½ Shot, 270 Pellets to the Charge.

Cylinder .	130, 118, 120, 128, 124—Average, 124.
Choke . .	195, 190, 197, 190, 193—Average, 193.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder .	140, 142, 137, 140, 145—Average, 140.
Choke . .	205, 226, 212, 218, 221—Average, 216.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder .	176, 165, 172, 180, 174—Average, 173.
Choke . .	252, 264, 261, 254, 260—Average, 258.

45 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder .	82, 85, 93, 87, 84	—Average, 86.
Choke . .	105, 124, 130, 120, 127	—Average, 121.

No. $4\frac{1}{2}$ Shot, 224 Pellets to the Charge.

Cylinder .	86, 75, 86, 107, 90	—Average, 88.
Choke . .	136, 150, 142, 146, 141	—Average, 143.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder .	91, 94, 97, 102, 93	—Average, 95.
Choke . .	162, 146, 150, 142, 147	—Average, 149.

No. $5\frac{1}{2}$ Shot, 270 Pellets to the Charge.

Cylinder .	106, 87, 93, 112, 108	—Average, 101.
Choke . .	180, 177, 168, 162, 170	—Average, 171.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder .	108, 113, 107, 110, 115	—Average, 110.
Choke . .	164, 156, 153, 165, 173	—Average, 162.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder .	132, 130, 153, 140, 148	—Average, 140.
Choke . .	212, 216, 220, 206, 213	—Average, 213.

50 YARDS RANGE.

No. 4 Shot, 193 Pellets to the Charge.

Cylinder .	52, 64, 61, 67, 63	—Average, 61.
Choke . .	87, 82, 105, 94, 96	—Average, 92.

No. $4\frac{1}{2}$ Shot, 224 Pellets to the Charge.

Cylinder .	59, 71, 53, 66, 63	—Average, 62.
Choke . .	97, 132, 111, 135, 117	—Average, 118.

No. 5 Shot, 245 Pellets to the Charge.

Cylinder .	91, 87, 93, 85, 87—Average, 88.
Choke . .	123, 134, 125, 136, 138—Average, 131.

No. $5\frac{1}{2}$ Shot, 270 Pellets to the Charge.

Cylinder .	80, 87, 85, 94, 90—Average, 87.
Choke . .	143, 128, 123, 148, 130—Average, 134.

No. 6 Shot, 304 Pellets to the Charge.

Cylinder .	80, 85, 106, 87, 90—Average, 89.
Choke . .	152, 146, 150, 147, 143—Average, 147.

No. 7 Shot, 382 Pellets to the Charge.

Cylinder .	94, 85, 100, 105, 107—Average, 98.
Choke . .	167, 172, 175, 170, 166—Average, 170.

An examination of the above series of figures proves the shooting to have been remarkably consistent throughout. I have not deemed it necessary to give the results of extended trials of the one-ounce load or of smaller charges. But in view of the tendency to adopt smaller charges of both powder and shot for driving purposes as well as for rabbit shooting I can recommend a new reduced load of 30 grs. of E. C. powder and $\frac{15}{16}$ oz. of shot, introduced to me by Messrs. Westley Richards. I find this charge gives average patterns of 45 per cent. cylinder and 68 to 75 per cent. choke, with an ordinary 12-gauge game gun at 40 yards on a 30-inch circle. From tests I have made both at the target and at live birds I am convinced that this is a satisfactory driving load. The patterns are consistent, evenly distributed, and effective as regards penetration, while recoil is greatly diminished. It is an ideal load, too, for boys and for ladies, and, indeed, all who cannot carry the usual weight.

The average results obtained in the foregoing tests are here tabulated for the easy reference of the sportsman as follows—

Game Gun.

42 GRS. OF A STANDARD BULK NITRO POWDER AND $1\frac{1}{8}$ OZ. SHOT.

Cylinder Barrel Patterns

Range	Shot Size 4	4½	5	5½	6	7
	Pellets to Charge 193	224	245	270	304	382
yds.	%	%	%	%	%	%
25	170=88	184=82	211=86	217=81	243=80	321=84
30	153=79	153=68	183=74	191=72	217=71	276=72
35	129=69	133=59	160=66	161=60	170=55	218=57
40	105=54	120=53	122=49	124=47	140=46	170=45
45	86=44	88=39	95=38	101=38	110=36	140=36
50	61=31	62=27	88=31	87=32	98=29	98=25

Choke Barrel Patterns

Range	Shot Size 4	4½	5	5½	6	7
	Pellets to Charge 193	224	245	270	304	382
yds.	%	%	%	%	%	%
25	187=97	206=91	229=93	259=98	288=94	360=94
30	177=92	197=87	223=91	237=89	260=85	343=89
35	166=86	189=84	206=84	219=82	242=79	313=81
40	141=73	171=76	172=70	193=73	216=71	258=67
45	121=62	143=63	149=60	171=64	162=53	213=56
50	92=47	118=52	131=53	134=50	147=48	170–44

The above choke patterns are excellent, and show what a good game gun can do, but are not to be taken as full-choke pigeon-gun patterns.

These tables should be of value to the sportsman as showing the actual patterns to be expected from a thoroughly well-bored gun and first-class cartridges at practical shooting ranges with six different sizes of game shot.

They show the choke barrel to have been just about 10 yards better than the cylinder barrel, judging by the pattern totals. For instance, the choke put 216 pellets of No. 6 shot within the circle at 40 yards, the cylinder put 217 pellets of the same size at 30 yards; further, at 50 yards this choke, it will be observed, made rather better shooting than the generality of cylinder-bored guns will do at 40 yards range.

There has been evinced in recent years a tendency to reduce the shot charges employed for the shooting of driven partridges and other game. The objectives of this movement are doubtless the reduction of recoil—particularly where the shooting is more or less continuous and heavy, also the lessening of damage to game when the shooting is conducted at close quarters.

For purposes of comparison it may prove of interest to give the result of some trials made with the same 12-bore gun used in compiling the foregoing record, with the reduced shot load of $1\frac{1}{16}$ oz. In this trial 42 grs. of a standard bulk nitro was again used, whilst in order to still further compare and test results, a supplementary trial with the equivalent charge of 33 grs. of a semi-condensed powder was made under precisely similar conditions, with results as follows—

CONDITIONS OF TRIAL WITH REDUCED GAME LOAD.

GUN . . .	A Westley Richards double 12-bore No. 16417; right barrel cylinder, left barrel fairly full choke; weight, 6 lb. 7 oz.
CHARGE, POWDER .	(1) 42 grs. of a standard bulk nitro; (2) 33 grs. of a semi-condensed nitro.
„ SHOT .	$1\frac{1}{16}$ oz. of sizes 4, 5, $5\frac{1}{2}$, 6 and 7.
TARGET . .	A circle 30 inches in diameter.
RANGES . .	25, 30, 35, 40, 45, 50 yards.

As the count of individual patterns was thoroughly consistent throughout, detailed particulars of individual patterns at each range, as given in the preceding trial, will here be quite unnecessary.

The following are the grand average results as to the patterns obtained with each powder and the several sizes of shot at the various distances fired at—

42 GRS. POWDER AND $1\frac{1}{16}$ OZ. SHOT.

CYLINDER BARREL PATTERNS

Range	Shot Size 4	5	5½	6	7
	Pellets to Charge 183	232	255	287	361
yds.	%	%	%	%	%
25	164=89	202=87	200=78	233=81	286=79
30	138=75	167=72	179=70	220=76	225=62
35	119=65	134=57	137=53	164=57	184=50
40	98=53	110=47	118=46	139=48	160=41
45	79=43	103=44	74=29	92=32	120=33
50	54=29	87=37	70=27	69=24	85=23

CHOKE BARREL PATTERNS

Range	Shot Size 4	5	5½	6	7
	Pellets to Charge 183	232	255	287	361
yds.	%	%	%	%	%
25	172=93	212=91	228=89	251=87	331=91
30	163=89	198=85	218=85	245=85	310=85
35	153=83	192=83	203=79	228=79	266=73
40	135=73	173=74	183=71	189=65	233=64
45	116=63	132=56	172=67	143=49	149=41
50	101=55	104=44	104=40	115=40	133=36

33 GRS. OF A SEMI-CONDENSED NITRO POWDER AND $1\frac{1}{16}$ OZ. SHOT.

CYLINDER BARREL PATTERNS

Range	Shot Size 4	5	5½	6	7
	Pellets to Charge 183	232	255	287	361
yds.	%	%	%	%	%
25	153=83	188=81	208=81	230=80	290=80
30	143=78	162=89	171=67	196=68	224=62
35	110=60	130=56	145=56	151=52	179=49
40	95=51	97=41	126=49	131=45	154=42
45	64=34	84=36	81=31	104=38	101=27
50	55=30	57=24	69=27	78=27	80=22

CHOKE BARREL PATTERNS

Range	Shot Size 4	5	5½	6	7
	Pellets to Charge 183	232	255	287	361
yds.	%	%	%	%	%
25	171=93	217=93	234=91	260=90	323=89
30	166=90	206=88	228=89	243=84	287=79
35	147=80	190=81	206=80	227=79	263=72
40	134=73	176=75	192=75	183=63	227=62
45	114=62	138=59	151=59	159=55	148=40
50	92=50	119=51	124=48	132=45	130=36

For a properly bored cylinder gun of 12-gauge 40 grs. of bulk powder, or its equivalent in a concentrated powder, and 1 oz. of shot I find give equal distribution and regular and good killing patterns. This charge may be preferred by those who wish to reduce the recoil of a 12-bore to the minimum, although as a sportsman I prefer the larger proportionate charges of powder to shot, more especially when the larger sizes of shot are used.

The shooting of the 12-bore has been treated at so great length for the reason, as above stated, that this size is in by far the most general use for game shooting. With regard to game guns of lesser bore, 16, 20, and so on, results proportionate to the above may be expected.

A good cylinder 16-bore at 40 yards with smokeless powder charge equivalent to $2\frac{3}{4}$ dr. black and 1 oz. No. 6 shot averages .	120–125
Ditto, Modified choke, averages . . .	160–170
„ Full choke, averages	180–190

A good cylinder 20-bore with smokeless powder charge equivalent to $2\frac{1}{4}$ dr. black and $\frac{7}{8}$ oz. No. 6 shot averages . . .	90–105
Ditto, Modified choke, averages . . .	135–145
„ Full choke, averages	160–170

Both 24-bore and 28-bore properly bored give killing patterns for use at short ranges, say to 35 yards.

With regard to guns of larger calibre, the conditions are considerably altered, as with these guns the best shooting is usually obtainable with shot larger than No. 4. Thus, in the case of wildfowl guns larger shot is used, shooting frequently taking place at longer ranges.

It is undoubtedly the fact that many guns of inferior make possess no guarantee as to shooting performance. It is equally true, on the other hand, that all makers of sound guns, gunmakers with, possibly, a reputation for good workmanship extending backwards for fifty years or more, carefully bore and test all their guns before permitting them to leave their hands.

At the same time, it will be patent to all having the most superficial knowledge of the gun that from tests, obtained under normal conditions, divergences will assuredly result whenever any radical changes are effected from the recognized standard in cartridge loading. For example, in plating guns, the gunmaker naturally uses a powder that will develop the most equable degree of force. Formerly, black powder alone was used for this work, but now that nitro compounds are so widely and generally used in the field, the gunmaker usually conducts his trials with some such powder as K.S., Schultze or Amberite—bulk nitros that are known to give steady average results.

If, however, on getting his gun home the sportsman decides to shoot with, say, a highly-concentrated explosive, or with a different form of wadding, or abnormally strong primers, the chances are that some considerable variation in the shooting and deviation from the pattern figures furnished with the gun will occur. Before adopting any change of load, it is necessary to prove the shooting of the gun under the altered conditions. Unless this is carefully done, many irregularities in shooting might remain unaccounted for, and practice in the field would suffer in proportion to the magnitude of the errors or irregularities of performance noticeable under those changed conditions of load.

The tables of patterns given go to prove that with proper load the shooting of the first-class modern sporting gun, bored and chambered to measurements as fine as one thousandth part of an inch, may be regarded as a fixed quantity. The shooting of such gun fully ascertained with reliable ammunition, the resultant figures may be accepted as the datum line, or the absolute standard for all immediate research or experimental work with ammunition of varied or variable character.

With such gun the conditions governing behaviour under trial are far more rigid and less liable to disturbance from atmospheric or other extraneous cause than is the case with the very best of modern sporting cartridges. All variations in the shooting performance of such arm of precision should be carefully regarded, so that a check may be kept upon defective ammunition—ammunition faulty from errors of manufacture, careless loading, or through the action of time or atmospheric effects.

The following are some among the principal changes or alterations from the primal standard, or proper condition of loads, which will be likely to alter the shooting of a gun. Without making too long a list of them, the chief causes of offence in procuring irregular shooting may be cited as—

1. Faulty ignition : caps too strong or too weak.

2. Considerable increase or decrease in the powder charge or shot load.

3. A change to quicker or slower burning powder—such quickness or slowness of combustion may be inherent, or may result from exposure to heat or moisture.

4. Very hard, imperfect, loose, misshapen, or ill-seated wadding.

5. Cartridge-cases too long or too short for the chamber, or untrue to gauge externally or internally.

6. Improper turnover : too lengthy, too short, or loosely effected.

Faults such as the foregoing are commonly found in foreign cartridges, whose chief recommendation is that they are "cheap;" that they may be low in price I admit, but of a certainty they are also "nasty."

Whenever any radical change is contemplated from the normal condition of load for the gun, I would strongly advise a consultation with the maker of the arm or of the ammunition—preferably with both combined. The opinion of some firm of ammunition manufacturers like Kynoch, Ltd., in conjunction with the gun- and rifle-maker of established reputation, should certainly suffice to elucidate all doubtful points or settle any difficulty presented to the sportsman.

It is scarcely fair to the gunmaker for the sportsman to try empirically new loads, and expect the gun to perform as well with them as with the reliable loads for which it was originally designed and built. It is to the shooter's own interest to secure as level shooting as possible, as with any irregularity of performance there will assuredly result a corresponding decrease in the ability of the gunner to maintain consistently good shooting practice in the field.

It has been accepted as a general axiom by several shooters, that with cylinder-bored guns, boring such as is now recommended in the generality of game guns, to increase the velocity much beyond that given by the ordinary game cartridge, which velocity has been standardized by the editor of the *Field* and others at 1050 feet per second, over 20 yards range, a falling off in pattern will result.

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Indeed, in the *Field* of October 17, 1903, the editor emphatically stated that "patterns cannot possibly be regular or effective with velocities attaining such an abnormal standard (*i. e.* 1162 feet per second over 20 yards), at any rate not in the light of our present knowledge." I do not however believe that gunmakers will rest satisfied with this limit of velocity.

Penetration.

Several attempts have been made to devise means for accurately gauging the penetrative energy of the shot pellets at killing ranges. It must, however, be confessed that the perfect penetration recorder has yet to be discovered. Ninety or more years ago Colonel Peter Hawker gave as his recipe for acquiring a knowledge as to penetration "a quire of thickest brown paper, by which the shooter will know to a certainty both the strength and closeness with which the shot is driven; and," he added, "he should remember that the strongest and most regular shooting gun is the best, provided that it does not throw the shot so thin as for a bird to escape between them." Unfortunately, however, the Colonel gave little or nothing in the way of precise information relative to the performances of the guns of his day.

The natural descendant and rightful successor of the foregoing crude scheme was the Pettit pad, so-called from the firm responsible for its manufacture. This pad, comprising forty sheets of brown paper tightly pressed and having a wire stitch at each corner to hold them together, is about 10 inches square. It is an extremely simple and remarkably ready means for testing the actual penetration of small shot at all practicable firing ranges. Unfortunately, this simple expedient does not perfectly answer the purpose for which it is intended, and this is indeed a pity, for its portability and extreme simplicity at once commends the brown paper pad to the regard of the sportsman.

The paper of which these pads is composed is liable to variations in both thickness and texture, and of course the resistance offered by the paper to the shot pellets increases or decreases proportionately as the paper is dry or damp. Some years ago I used a quantity of the Pettit pads for experimental work in testing guns and powders and loads, but with every care used in their selection, in drying and affixing, I could not truly regard them as giving anything more than a rough indication of the power of a gun. It will not serve any useful purpose, therefore, to give records relative to the shooting against these pads, for the simple reason that when wishing to effect further comparisons, the assurance could not be given that paper of the same texture, substance, or dryness could be obtained. The way in which these brown paper pads are fixed up considerably affects the penetration of the pellets. For instance, if the pads are fixed closely against the target the solid backing of iron increases their resistance, and the shot will get through fewer sheets. If on the other hand the pads are suspended clear of the target several more sheets will be pierced, as also will be the case if the pads are pressed edge-wise, so as to open the sheets before firing at them.

Most of the records that have been handed down from past years do not state the conditions as to the fixing up of the sheets, and this renders them unreliable for purposes of present-day comparisons; so much depending upon the fact, as already stated, as to whether these pads are fortified by the solid backing of an iron target or are hung clear of all support of that nature. In the *Field* trials of 1875, when the choke-bore was first tried against the cylinder, Dr. Walsh recorded the highest average penetration of the choke-bore against Pettit pads as 34·41 sheets, and of the cylinder at 28·66 sheets, both firing the same weight of No. 6 shot. In my own experiments, conducted twenty or more years subsequently to the above, I cannot recollect at any time approaching within several sheets, probably ten or so, of Dr. Walsh's figures. As, certainly, the guns and powders with which I shot were not inferior to those of Dr. Walsh's time, one is forced to the conclusion that the pads at which I fired were considerably stouter or tougher than were those made in 1875.

Until the year 1879 the gunmakers of this country relied more or less upon the Pettit pad for ascertaining the actual penetration of small shot. About that time Dr. J. H. Walsh, who was then the editor of the *Field*, and responsible for the numerous trials of guns carried out under the auspices of that journal, expressed himself as highly dissatisfied with the variable results obtained with the pad. Consequently, he set about devising other means, and with the aid of two well-known gunmakers, Mr. Jones of Birmingham and Mr. Green of Cheltenham, the machine known as the *Field* Force gauge was produced. This was described by the originator as "A machine which registers automatically the effect produced by the blow given by the central pellets of a charge on a spiral spring." In order to compare it with the pad as nearly as may be, a 10-inch square was adopted.

In a good cylinder-barrel there are usually from 25 to 30 pellets striking the 10-inch plate, while a full choke varies from 50 to 70. The plate is made of 17-gauge steel turned up at the edges, and having a horizontal platform firmly attached to its back and about 3 inches wide. To allow this plate to give way to the blow of the shot, it is suspended by four parallel arms to a strong frame of cast iron. As the platform travels backwards a small friction roller drives the short arm of the lever backwards, the long arm travelling in the opposite direction. At the end of the long arm is a vulcanite pointer, this travels on a plate of white metal, which is coated with black paint immediately before each shot. As a consequence of this arrangement, when the steel plate is struck it drives the pointer a certain distance, removing the black paint and leaving a white line on the plate on which a scale of values is fixed. Further, Dr. Walsh stated—"Of course it is plain enough that this gauge can be used to compare two or more guns fired against one another at any fixed time, the one recording the greatest force in proportion to the number of pellets striking the plate having manifestly the stronger penetration."

To my mind this instrument fails to accomplish the object for which it was designed. It attempts to record the weight of a blow without taking due account of the speed of that blow. This is fatal, for it must be patent to any one giving due regard to the question that the united momentum of a few pellets from a charge say of BB shot might send the plate no further back than would the collective momentum of an equal weight of No. 6 shot pellets. Thus the indicator and the subsequent calculation would record equal value for each, whereas the BB might in reality have twice the penetrative energy of No. 6. Moreover, this instrument is, for all practical purposes, totally unreliable, inasmuch as, like the chronograph, it may be operated to a greater or lesser extent by the speediest pellets. Thus the fast pellets would actually be operating the machine before the others reached the plate—perhaps only in time to catch it on its rebound. Thus a percentage of the slower pellets striking the plate must be non-efficient.

Excellent service may be rendered by the chronograph in taking shot velocities at the muzzle of the gun, and in thus determining the propulsive energy exerted by the powder. From such records we can compare the rate of propulsion imparted to the shot by one powder as against another powder, by one gun as against another gun, or the initial speed of one charge or size of shot as against another charge or size of shot. Such records are interesting and instructive, and the more so the nearer they are taken to the muzzle of the gun, for the failure of the chronograph to establish true records commences from the moment the mass of the shot charge loses cohesion. As the shot charge leaves the muzzle the speed of this mass may be from 1200 to 1300 feet per second; this rate of progression is quickly reduced when disintegration of the charge takes place, and individual pellets have to cleave the air by the aid of their own momentum, with the result that those possessing least of this concomitant of progress quickly fall several feet behind the leading pellets in even so short a race as forty yards.

The card rack is one of the simplest and handiest devices for testing the penetration of small shot so far produced. Whilst possessing certain drawbacks similar to those urged in respect of the brown paper pad—such as variations in the thickness of the sheets, and as regards the amount of moisture they contain—it is, nevertheless, the most useful of all penetration tests extant.

The card rack is a wooden box, open at the top and the firing end, in which sheets of strawboard of a certain substance are placed about 1 inch apart—much after the style of the toast in the rack on our breakfast-table. Provided due care is exercised towards ensuring the employment of strawboard of precisely similar gauge, texture, weight, and dryness this is the best and most thoroughly practical test at present available for the sportsman's purpose.

The spaces between the cards being numbered, the actual penetration exhibited can be ascertained at a glance. In this respect the card rack is far in advance of the brown paper pad, above which it has the further advantage that the material punched out of the cards drops into the spaces and so does not interfere with the course of the shot, whereas the paper punched out of the pads is very frequently pushed forward by the pellet, thus hampering it to an unwarrantable and ever-varying degree.

There is this also to be said in favour of the card rack, viz. that the precise form of the pellets can be immediately noted. The amount of deformation to which they have been subjected within the gun-barrel is clearly and unmistakably defined, and the close observer will be able to see to an exact degree the effect of this deformation upon the penetrative force of the pellets. With the card rack I have been able to ascertain quickly the relative killing properties of many guns, charges, and sizes of shot, and as a rough-and-ready test for both gunmaker's and sportsman's purpose, in the present state of our knowledge it is of considerable value.

Duck Gun Performances.

Trials to determine the shooting properties of duck guns are usually carried out under somewhat different conditions from those governing the testing of game guns. Because of the generally unapproachable nature of wildfowl, duck guns are designed to kill at longer ranges than are the guns used for shooting game. Thus, in this class of gun choke-boring and larger shot sizes are the order of the day.

The 4-bore is generally made up as a single barrel, owing to the increased weight and bulky proportions inseparable from double guns of this calibre, for the hand of the average individual cannot fully and firmly grasp nor control such a mass of wood and metal as is comprised in the double 4-bore. The shot charges used in 4-bores range from 3 oz. for guns of 13 to 14 lb. weight, up to 4 oz. for those weighing somewhere in the region of 20 lb. Naturally, the ranging power of these, and indeed of all wildfowl guns, is governed by the size of the shot employed in them and their power to sufficiently concentrate the flight of that shot. Coupled with this power of concentration, therefore, the larger the shot the longer the killing range of the gun.

Formerly, black powders alone were available for use in shot-guns of the larger bores. In recent years certain of the nitro compounds have come to be extensively used. For several years I was engaged in carrying out a series of experiments, both at the target and upon fowl, with nitro powders in wildfowl guns, at the instance of the *Field* newspaper.

I am thoroughly convinced that K.S., Amberite, Schultze, and other of our bulk nitros contribute greatly to success in this form of shooting by their reduced noise, smoke, and recoil upon explosion as compared with black powder. That these powders will shoot satisfactorily in wildfowl guns I have repeatedly found. With 4-bores and these nitro powders I have shot grey geese, brent geese, mallard, wigeon, teal, curlew, and plover at distances ranging from 80 to 100 yards, and now and again birds have been dropped at ranges considerably beyond the latter figure when A, AA or other large shot has been used.

The 8-bore, intermediate in size betwixt the 4-bore and the 10-bore, is generally regarded as sufficiently powerful for most forms of wildfowl shooting. Guns of this calibre are more manageable than the 4-bore, and carrying a quite considerable charge of shot—ranging from $2\frac{1}{4}$ to $2\frac{3}{4}$ oz. or so, according to weight of gun—they are not so much inferior to 4-bores in the matter of their killing powers.

The 10-bore double-barrelled gun is at once a remarkably handy and powerful weapon for the purposes of all-round sport with the wildfowl. One of 10 lb. weight, made by Westley Richards, that I had was an excellent performer. Firing 2 oz. of B shot for large fowl, and $1\frac{3}{4}$ oz. of No. 3 for smaller birds, this gun killed well and cleanly at remarkably long distances.

The wildfowling 12-bore is a comparatively modern production. It is a 12-bore designed to carry larger charges of both powder and shot than may be discharged from ordinary guns of this calibre. This heavier loading is accomplished in one of two ways: (1) by a lengthening of the chambers and the use of $2\frac{3}{4}$- or 3-inch paper cases, or (2) by the employment of the thin brass "Perfect" cases made by Kynoch, Ltd., of Birmingham. Thus, in the No. 12 long paper case, as also in the brass "Perfect" case, a charge formerly considered sufficient for a 10-bore paper-case gun can now be employed. Guns of this class usually range in weight from $7\frac{1}{4}$ to $8\frac{1}{2}$ lb., the former used with $1\frac{1}{4}$ oz., the latter with $1\frac{1}{2}$ oz. of shot.

Recoil.

Although, I suppose, recoil must be considered to come within the category of "gun performances," it cannot be regarded as being amongst the most pleasing of them. The tendency among sportsmen and gunmakers in recent years has been wholly in the direction of reducing the weight of the gun. To some extent the lesser proportionate recoil given by nitros in comparison with black powder has aided in this endeavour. At the present time there appears to be a movement in the direction of reduction of charges. If we go on at this rate, the 12-bore game gun will soon come to be merely 12-bore in name, for we are rapidly arriving at the stage where 16-bore loads are being advocated for use in 12-bores, 20-bore loads for use in 16-bores, and so on. In the days of muzzle-loaders a fair shot load for even 14-bores was considered to be $1\frac{1}{4}$ oz., and guns of 13- and 12-bore commonly carried that load, but with the advent of breechloaders the load adopted for 12-bores came to be $1\frac{1}{8}$ oz. only. Now we see this reduced to $1\frac{1}{16}$ oz. as often as not, and frequently to 1 oz. At this rate of retrogression the denomination of bore will soon cease to be the guide as to the load and shooting capabilities of a gun that it formerly was.

Sensitive gunners have little difficulty in classing recoil under two headings: (1) push, (2) kick or jar. By way of practical illustration the two may be compared thus. The first is the comparatively easy rebound caused by the large-grained black powders and slower-burning nitros which consume along the barrel. The latter is the sudden clash and jar of the fine-grained black or other explosive whose combustion is practically completed within the cartridge chamber.

Faulty boring, ill-formed cones and chambers, and excess of charge in proportion to weight of gun are common factors in the production of abnormal recoil in the shot-gun. With ordinary primers, explosives, and methods of loading the due relationship of gun to load to ensure thoroughly comfortable shooting in respect of recoil may be expressed as 12 oz. of gun to each $\frac{1}{8}$ oz. of shot.

Under this formula the 12-bore designed to carry 1 oz. of shot will weigh precisely 6 lb.; that intended for use with $1\frac{1}{8}$ oz. will weigh $6\frac{3}{4}$ lb.—a very proper weight for such gun if No. 6 and smaller sizes are much used in it. These remarks apply more particularly to 12-bore guns; in guns of smaller or of larger bore variations from the above formula may be needed. For instance, if it be desired to use 1 oz. of shot in a 20-bore—as many gunners were at one time in the habit of doing—with this comparatively lengthy column of shot there would be increased friction with a resultant increase in recoil, so that a six-pound gun, at which it works out, would be sufficiently heavy to ensure thorough comfort when using 1 oz. of shot in 20-bores. It may be accepted as a general axiom that the smaller the shot the greater the recoil, all else, of course, being equal when effecting comparisons. Were it not so, the proper weight for the 4-bore firing 3 oz. of shot would, under this rule, work out at 18 lb. If we were in the habit of firing No. 6 shot out of these great guns, quite possibly this latter weight would be requisite to insure the comfort of the firer. But, of course, no one ever does use shot so small in 4-bores; any shot of smaller size than No. 1 is scarcely qualified to bring out the full powers and generally to produce the best results with so large a gun. Thus it comes about that 3 oz. of large shot in 4-bores of 13 to 14 lb. weight may be comfortably discharged from the shoulder by men of average physique.

Length of gun-barrel may appreciably affect recoil. A short barrel is usually more productive of heavy recoil than a long barrel. Sometimes a reduction in length of gun-barrel is effected with the view to enable the gunmaker to make up a lighter gun. In such case it often enough happens that full charges are used, and so, of course, there may be additional recoil from two causes: 1st, from the reduction in weight in proportion to charge; 2nd, from reduction in length.

Sensitive gunners sometimes complain that short barrels are contributory to "gun-headache." The removal of the noise and concussion of the explosion 2 or even 4 inches from the firer's head might possibly modify the effect, but it is scarcely conceivable that 30-inch barrels would in this respect have the advantage to any appreciable extent over those of 28 inches in length. The distressing symptom known amongst shooters as "gun-headache" is often enough attributable to lack of tone in respect of the gunner's bodily health and condition. I think it is highly probable that if the gunner so suffering were to change over to guns having barrels of 32 inches, or, if you will, even to those of 36 inches, the remedy would not be found until the

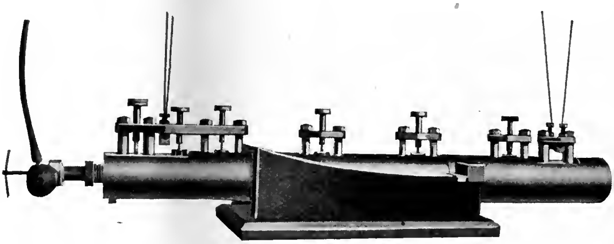


FIG. 62.—HOUSMAN PRESSURE GUN.

bracing up of the system were effected. By the way, it may be just as well here to remark that in those cases where the headache is clearly assignable to the concussion of explosion, relief may frequently be found by placing a little cotton-wool in each ear.

Quite recently it has been suggested that "gun-headache" arises from eye-strain caused by constantly looking up at game passing overhead, as in the modern form of sport known as driving. This, on the face of it, appears to be at least a reasonable assumption, for we all know that straining of the eyes frequently causes severe headache. Still, those inclining to the belief that the headache is due to the concussion of explosion upon the ear and the jar of recoil upon the brain are further fortified in their contention, as in few phases of sport is the firing so rapid as in driving.

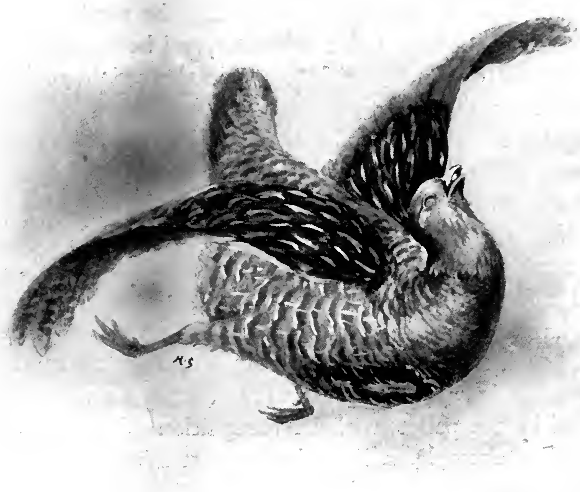
Several ingenious devices for ascertaining the recoil of firearms have been planned, the general lines upon which the inventor has worked in this direction being towards the utilization of springs, or weighted levers, for checking the energy of the rebound and so ascertaining the weight of the recoil.

The sportsman does not appear to have attached very much importance to these recoil recorders, possibly for the reason that machines devised on the above lines tell only of the weight of recoil. Records of recoil, to be of real value, should show the true energy by indicating the speed as well as the weight of the rebound.

The gunner fires a gun giving a certain recoil upon the machine, and he finds it not unpleasant to shoot with. He takes another charge, or, maybe, another gun, giving the same record, but in which the speed of the recoil is greater, and he instantly avers that the gun kicks like a horse. To ascertain the weight of a stationary object is a simple matter; for this purpose simple graduated springs or weighted levers answer admirably. For ascertaining the weight and momentum of a moving object, springs or weighted levers, simply applied to determine the weight of rebound, are liable to mislead.

An arrangement upon the simple spring or weighted lever plan, termed a force gauge, for determining the force of moving shot pellets has already been described. It was an ingenious mechanical device, but its records were totally unreliable for the simple reason that, *inter alia*, they were attempts to weigh the blow delivered by the pellets without recognition of the speed of that blow. For example, a light hammer striking the plate of that force gauge at a high velocity might establish the same record as a heavy hammer moving at less speed—and so with the recoil apparatus made on the simple spring or weighted lever plan.

The best device extant for the testing of recoil is the Housman Pressure and Recoil Gun. This takes the ingenious and comparatively simple form of a heavy barrel suspended by wires and free to move backwards under the influence of recoil. It thus records upon a graduated register the precise amount of the movement. This gun not only registers the recoil of a charge, it also simultaneously records the powder pressures exerted at six different points along the barrel, and in so doing tests the regularity of combustion of the explosive. Further, in conjunction with the chronograph, it provides a record of the velocity of the shot over a ten yards' range.



CHAPTER VI

SHOT-GUN AMMUNITION

Cartridges and Cartridge-loading—Primers—Gunpowders—Powder pressures and Barrel bursts—Shot: Velocity and Sizes.

THE CARTRIDGE-CASE has important functions to perform, the proper carrying out of which determines its fitness for the sportsman's purpose. It is designed to form a convenient vehicle for—

(*a*) The ignitive agent, the primary cause of all explosions.
(*b*) The propellant explosive.
(*c*) The missiles in the form of small leaden shot.
(*d*) The wadding necessary for the due confinement of the powder gases and the propulsion of the shot.

It fulfils other subsidiary but all-important offices, such as keeping the powder from direct contact with moisture, also the setting up of sufficient resistance, by means of the turnover, to enable the explosive to develop a due amount of its propulsive energy.

If asked to mention the chief advantages conferred by the system of loading guns at the breech, over and above that of loading at the muzzle, the average sportsman of to-day would probably reply—"Facility and speed of loading." But this is not the whole truth with regard to that question, there are other considerations quite as weighty. At one sweep the simple cartridge-case—to which we have become so familiarized as almost to forget the benefits it confers—did away with powder-flask, shot-belt, ramrod, loose wadding, and loose caps, or cap-charger, all of which were comprised in the necessary field impedimenta of the muzzle-loading gunner.

Thus, it will be observed, the modern cartridge comprises within itself each component necessary to insure the due propulsion of the shot; and, what is more, the highly inflammable and sensitive explosive compounds, inseparable from the use of firearms, are more secure than ever before from the inroads of sparks from the sportsman's pipe or of moisture.

Cartridge-cases for use with the shot-gun, roughly, may be divided into two main classes, paper and brass. In the former class the base is of brass and the tube of tough paper; in the class last named both base and tube are of brass. Frequently, in order to cause them to eject more freely from the gun-chamber, as also to render them waterproof, and so further to improve their keeping qualities, the paper cases have an outer covering of thin brass extending for a quarter, half, or nearly the whole of their length.

Several years ago, Messrs. Kynoch, of Birmingham, introduced the thin brass case known as the "Perfect." This being practically waterproof is the ideal cartridge-case for the wildfowler, in the conduct of whose sport fog and rain, snow and sea-water have so often to be encountered.

At this juncture it will be well to call attention to the fact that the numerals No. 10, No. 12, and so forth, applied to fix the size of these thin brass cases are not expressive of the same value as they are with the paper case. The external diameters of cases bearing the same number measure alike, but as the Kynoch "Perfect" has thinner walls than the paper case, its internal diameter is considerably greater. Thus the wadding requisite for a "Perfect" case is some two sizes larger than for a paper case of the same denomination. For example, whilst the wadding needed for a No. 12 paper case may be of ·738 to ·740 inch diameter, that for a No. 12 thin brass "Perfect" case may be some forty-thousandths of an inch larger. Sportsmen have sometimes been puzzled by the terms "brass-case gun," "paper-case gun," and it may be well to explain that these distinctive appellations are made use of by gunmakers to denote that a gun is specially bored either for use with brass or with paper cartridge-cases. This implies that a specially bored brass-case gun, one designed to use, say, No. 12 "Perfect" cases, is practically a 10-bore, a brass-case gun to use No. 14 "Perfects" is a 12-bore, and so on.

Cartridges and Cartridge-loading.

There is a constant desire expressed by many shooters to secure the highest standard of accuracy with regard to cartridge, explosive, wadding, and shot. Many, I find, are ever ready to discuss minute matters of detail, and to express dissatisfaction should the merest variation occur in the loading, the turnover, or in the character of the constituents of their cartridges. Yet, often as not, these are the very men who grumble at paying the price necessary to insure the production of thoroughly reliable cartridges. Whilst one may hope to have, in some degree, both a sound case and fairly accurate loading in low-priced cartridges, it is irrational to expect similar quality and uniformity of material, of construction, and of killing powers in cartridges bought for, say, 6*s.* 6*d.* per 100, as in those purchased for half a guinea or more.

There has been a distinct tendency in recent years towards the use of low-priced cartridges, and this in quarters where one would look for a display of sounder judgment. The inconsistency displayed by some mortals is altogether inexplicable. For example, men are to be found who after laying out sixty guineas on a first-grade gun forthwith proceed to fire fifth-grade cartridges therefrom. One can only compare such folly to the yoking of a tumble-down old crock to a one hundred and fifty guinea brougham.

Many people use the terms "low-priced" and "cheap" indiscriminately, but so far as cartridges are concerned they are not always synonymous, whatever they may imply in respect of other goods. In fact, the one term is frequently the antithesis of the other, as on occasion it may be proved that the components of the shot-gun cartridges sold for 10*s.* 6*d.* per 100 are relatively cheaper than are those of cartridges priced at 6*s.* 6*d.* per 100.

To quote an extreme case: take smokeless powder 12-bore cartridges costing 6*s.* 6*d.* per 100, and compare them with those at 10*s.* 6*d.* obtained from any gunmaker of repute, a close scrutiny will convince the most inexpert observer that the higher priced article is the cheaper of the two. In the event, however, of the failure of such inspection to carry conviction, certain irregularities observable in the shooting of the low-priced cartridges will, I imagine, speedily convince him that they are highly inconstant agents for controlling the flight of the shot. Among the inaccuracies observable in low-priced cartridges the following may be enumerated—

1. Variations in the thickness of the walls of the case.
2. " " length of the case.
3. " " amount of turnover.
4. " " diameter of wadding.
5. " " thickness of wadding.
6. " " texture and elasticity of wadding.
7. " " weight of the powder charge.
8. " " granulation of the powder.
9. " " weight of the shot charge.
10. " " size and weight of the shot pellets.
11. Lack of sphericity in the shot pellets.
12. Absence of metal lining.

So long as the cheaper and less reliable qualities of paper are used in the construction of cartridges, variations in the thickness of the walls of the case or of length of tube are likely to occur; for, however great may be the compression to which such paper is subjected, perfect rigidity cannot be absolutely insured, the inherent looseness and elasticity of its fibres causes a reaction.

Damp also greatly affects paper of this sort, and is always acting in the direction of its relaxation, so that the dimensions of inferior paper-cases are, more or less, according to the conditions of their manufacture, and the state of the atmosphere, subject to slight variations in respect of their form and measurements. This being so, one is impelled to the belief that, in order to secure the best cartridges, sportsmen must not grumble at paying a fair price for them.

Only by the employment of the most costly tools and machinery, and the exercise of unremitting care and skill in their manipulation, as also by the use of the best materials of construction, can really sound and reliable cartridges be produced. All this, of course, implies the outlay of considerable capital, both in the establishment and upkeep of this costly plant, and the payment of high wages to thoroughly qualified workers. Therefore, I would emphasize my previous statement, and say that cheapness is not the necessary corollary of lowness of price. Cartridges to be truly cheap must be thoroughly good and efficient in every particular, as well as of practical design for the work they will be called upon to perform.

All shooters who desire to be in the first rank with regard to their practice in the field should always use first-class ammunition. Bad ammunition is dear at any price. Without good cartridges in a good gun, no shooter can do himself justice by shooting consistently and regularly up to his true form.

Kynoch, Ltd., of Birmingham, first introduced to the sporting world an excellent series of cartridges of uniform pattern, entirely loaded by the most approved machinery on commercial lines. These cartridges rank from the cheaper class, the "Bonax," to the highest priced cartridge having a whole covering of metal, and upon which has been bestowed the distinctive title "Opex."

As the subject had never before been adequately treated in any work on shooting, it struck me that some information relative to factory-loaded cartridges might prove acceptable to my readers. I therefore applied to Kynoch, Ltd., who at once gave me *carte blanche* to go where and how I pleased through the huge cartridge factory at Witton, where the manufacture and loading of cartridges goes on day by day the whole year round, and millions upon millions are turned out.

Having been afforded these free facilities for gaining a knowledge of the most approved modern methods, the freest use was made of such exceptional opportunities for studying the processes involved in the manufacture and loading of ammunition.

Kynoch's claim, as indeed is claimed in most factories laid down for the production of a standard line of goods in large quantities, that the constant output hour by hour, day by day, and year by year, with the same supervision, the same hands employed on particular work, and the same methods of treatment throughout, must and does insure regularity of production. Cases, caps, powder, wads, in fact all but the shot, are made in the Kynoch factories, and thereby the suitability of the one to the other is assured.

I found that at each stage of manufacture, cartridge-cases are gauged for internal and external diameter, thickness of rim, diameter of rim, and diameter under the rim. The anvils are made to one-thousandth part of an inch; the caps in their diameter also gauge to the same fine measurement, and after priming they are tested for sensitiveness and flash both in the cartridge-case and independently.

With regard to waddings, all pass through an inspection for diameter and thickness before entering the loading-rooms. The powder is taken in batches of 2000 lb., which are tested and passed before being issued for use.

Every sportsman recognizes that his day's success is largely dependent upon the uniformity of his cartridges, and it is certain that Kynoch, Ltd., may justly claim to attain to greater precision of method in respect to the production of their factory-loaded ammunition than is ever likely to be secured by the methods employed in the production of the average hand-loaded cartridge.

Nevertheless, there is no denying the excellence of the best hand-loaded cartridges issued to the sportsman by many leading gunmakers.

At Witton, I found that before commencing on the day's work in loading, the custom is to take twenty cartridges from each machine, and test them for weight of powder and shot, velocity, pressure and pattern. This work is done by an inspection or proof department, which is separate from that of the factory, and any batch of powder or cartridges giving velocities below the standard of 1140 feet per second, set by Messrs. Kynoch, or showing higher pressures or faulty patterns, are at once rejected.

The loading machines used by Kynoch's are designed by themselves, and are made at their works at Witton. Models of skill and ingenuity of design, they are of remarkably solid and strong construction, it being necessary that there should be perfect rigidity of structure in order to secure certainty of action and accuracy of results. The cartridge-cases are fed down a hopper, and enter the machine singly; the reception of the powder charge, wadding, and shot, in fact, the whole operation of loading, is completed automatically before the case leaves the machine.

The nature and amount of turnover given to a cartridge has a vital effect upon its performance. In order to insure a perfect turnover, the attendant at each machine is supplied with a gauge, which exactly records the depth of tube to be left for the turnover. As this gauge is used on one cartridge in every ten, uniformity in this important respect is guaranteed. The turnover is effected by a chuck revolving 3000 times per minute; this naturally effects a clean and polished turnover, there being none of that roughness, creasing, or looseness of turnover sometimes observable in the work of hand turnover machines turned at rates less than 200 revolutions per minute.

The great feature that appeals to the sportsman on observing the various routine duties and operations involved in the manufacture and filling of these factory-loaded cartridges, is that every mechanical device that human ingenuity and skill can accomplish is employed in order automatically to carry out the various processes, thus avoiding errors incidental to manual operation. Only

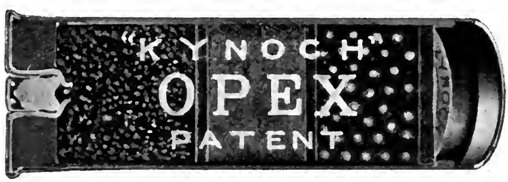


Fig. 63.—Opex Cartridge in Section.

by this method may be insured the utmost uniformity in the loading of cartridges and ultimate regularity of performance in the field.

The "*Opex*" is essentially an all-weather cartridge. Its construction enables it to repel the inroads of wet, either through direct contact with rain or snow, or from exposure to a moisture-laden atmosphere. As may be gathered from the illustration given, Fig. 63, this important qualification of absolute water-proofness is secured by building a paper case with a solid-drawn brass covering, which extends along and slightly beyond the paper tube, thus affording complete protection to the turnover. Considerations as to the keeping qualities and the storage of cartridges are occasionally matters of concern to the sportsman, who may, perchance, have some remaining over from one shooting season to another, or, possibly, may have occasion for sending or taking ammunition abroad.

Naturally, the "Opex," from its construction, is better qualified to fulfil the requirements of either situation than is an all-paper case.

The "*Kynoid*" case is built with a deep head, and, in addition, the paper is treated with a water-proofing solution so that it may the better resist the damp. This, of course, increases the cost of production, rendering these cartridges somewhat dearer than the grade next to be considered.

The "*Primax*" cartridge has a long brass head, which, as in the case last mentioned, extends some $\frac{5}{8}$ inch up the tube, as seen in the accompanying illustration. This assists to render ejection easy. Save that the paper of this case is not subjected to the water-proofing process, the materials of which the "Primax" cartridge is composed equal in all respects those of the "Kynoid."

The "*Bonax*," although a low-priced cartridge, is of sound

FIG. 64.—PRIMAX CARTRIDGE.

manufacture throughout. The paper, anvil, cap, and brass of which the base of the head is made are of the same quality as in the best cases.

In order most fully to assure myself that both the methods of manufacture and the loading of cartridges as practised at Witton are productive of thoroughly good and consistent shooting, a box each of "Opex," "Kynoid," "Primax," and "Bonax" were taken indiscriminately from stacks aggregating several millions lying in the storeroom direct to the trial-ground. These cartridges were then shot at the target for pattern from an ordinary game gun and from the Housman gun for recoil, pressure, and velocity. The following remarkably even and regular average results were obtained, 10 shots from each batch of cartridges being fired, the shot charge in each case being $1\frac{1}{16}$ oz., No. 6. The powder charge, in fact, wadding and everything, being Kynoch standard loading.

PATTERNS ON 30-INCH CIRCLE.

CYLINDER BARREL.				
"Range."	"Bonax."	"Primax."	"Kynoid."	"Opex."
yds.				
35	162	158	166	160
40	128	128	133	125
CHOKE BARREL.				
40	196	193	209	191

CHRONOGRAPH, CRUSHER GAUGE, AND RECOIL RESULTS.

	Recoil in ft.-lb.	Velocity, feet per second.	Pressure at breech in tons per sq. in.
"Bonax"	111·5	1146	2·97
"Primax"	110·9	1145	2·84
"Kynoid"	109·0	1125	2·35
"Opex"	104·3	1136	2·46

It may be easily understood that with a perfect organization like Kynoch's, where each shop or department is kept to its own special work, there could not well be any mixture with regard to the quality of metals and materials. Kynoch's realize that in placing a low-priced cartridge on the market it must, in order to maintain its position, be of first-rate quality, and in every way reliable, otherwise it would not sell. Lasting good could not result from making inferior ammunition.

The main difference between qualities of cartridges like "Opex," "Primax," and "Bonax," is in the *quantity* of brass used in the building of the cartridge, and, naturally, this effects one result, that is, the perfect working of all grades in the gun. The brass in the "Bonax" case alone costs as much as all the other material, *i. e.* paper, composition in the cap, the iron cup in the head, and the labour in making everything; therefore the advantage gained in buying the better qualities consists in an increased strength of head due to the larger quantity of brass, which assists ejection in an ejector gun.

With regard to the materials used in the manufacture and loading of the above-named proprietary cartridges, it will, doubtless, interest the gunner to learn that the cap is the same in each grade of ammunition. The powder, also, in each class is precisely of the same quality throughout. The shot, too, is the same, chilled or soft.

The "Bonax," however, is loaded with a brown wool wad as against the white wool wad in the higher-priced cartridges. I am told that white wool has a higher commercial value on account of being used in many industries where brown wool is not permissible; also that brown wool answers very well the practical requirements of the sportsman. This being so, it may be asked why the brown is not used in the higher-priced cartridges. A prejudice exists among a certain class of shooters against anything except white felt wads. The card wads may be dismissed with the simple statement that as regards materials, size, thickness, and so forth, they are identical in each grade of loading.

Having fired during the past years many thousands of Kynoch cartridges, I am in a position to speak with some show of authority as to their behaviour in the field. My experience of these cartridges has been of the most varied description, including as it does nearly all calibres in both paper and brass, from the big 4-bore down to the diminutive ·410 cartridge.

For several years I was engaged in conducting an extensive series of experiments with guns, cartridges, and black and nitro powders for the *Field*, the *Shooting Times*, and other sporting journals. These tests were made not alone at the target, but also upon game and wildfowl under every conceivable condition, and I have long since come to the conclusion that whilst other makers may turn out cartridges as good as those of Kynoch, Ltd., I have yet to meet with any that excel theirs in the matters of strength and regularity of shooting.

Some cartridge-loaders may strive to attain high velocities in the conviction that that is the *summum bonum;* whilst others are impressed with the idea that abnormally close pattern will best insure success in the field.

If I find cartridges exhibiting any greater degree of force than is usual, further research invariably reveals the fact that such cartridges are deficient in the other important respects of pattern or regularity of performance; or that in the event of exceptionally high patterns being secured, there is deficiency in the force generated.

Experience teaches that to insure the utmost success in sport, one's cartridges should comprise such happy balancing of advantages, of high velocity consistent with even pattern, of perfect ignition and combustion of the propellant, and so forth, by which alone may be secured the paramount feature in all really good cartridges—regularity of performance.

For my own shooting I would far sooner have cartridges with a velocity even so low as 950 feet per second, provided I knew what I had to start with and that this velocity would be constant, than I would have those having a nominal reputed velocity of 1200 feet per second and yet ranged from 1000 to 1400 feet per second. The best shot who ever handled a gun could not hope to perform creditably with the latter, whereas he might shoot really well with the former, once accustomed to the reduced velocities.

Given good guns, the only hope of the poor performer and the good shot—the one to attain to proficiency, and the other to maintain his reputation in the field—lies in the use of cartridges whose chief characteristics comprise regularity and consistency of performance.

Summed up, therefore, the chief points that I have been able to elicit relative to the manufacture and loading of Kynoch cartridges in the factory, and by taking cartridges from the storeroom, and testing them on the firing range for velocities, pattern, pressures, and recoil, and by actual use on game in the field, are the following—

1. Suitability and soundness of materials.
2. Uniformity of manufacture and of loading.
3. An intelligent balancing of loads.
4. Maintenance of a high and consistent standard of shooting.
5. Regularity of performance in the field in any weather.

I might add here, that on completion of the loading process, all Messrs. Kynoch's own proprietary cartridges are packed and sealed down in boxes. Thus they reach the consumer in a form which insures perfect inviolability of all cartridges as issued from the factory.

In days gone by, some sportsmen at home, and very many abroad, preferred to load their own cartridges. It may be admitted that there was then justification for the adoption of such measure, for with black powder then in regular use, cartridge-loading proved a comparatively simple process. Now, however, amidst the multiplicity of powders, each differing from the other, the need exists for the due following of certain fixed and more or less intricate formulæ. Thus cartridge-loading has developed from a comparatively inexact to an exact process, involving an exercise of care and knowledge not at all likely to be bestowed upon the work by the amateur loader of average ability and experience. In some cases the form and consistency of the nitro powder makes it impossible for the sportsman to load it with even the best kind of hand machine. Apart from this consideration, the due loading of explosives of the higher development, whose constancy and certainty of action may alone be secured by the close observance of strictly defined methods involving apothecarial exactitude in the weighing of charges, of mathematical precision in the selection and seating of suitable forms of wadding, and the employment of somewhat intricate machinery for the proper fulfilment of the scheme, involves the bestowal of care and attention such as the average amateur loader could not insure.

The best instruction I can offer those desirous of exploring the unknown with regard to new nitro powders, abnormal loads, etc., is to first consult the manufacturer of the explosive. Depend upon it, the loads recommended by the several makers have not been arrived at without much painstaking and laborious experiment, and the advice tendered with regard to proportion of powder to lead, nature of wadding, primer, cartridge-case, and turnover, is at least worthy of the serious consideration of the amateur experimentalist.

Primers.

Due ignition of the powder charge is a matter that has ever been fraught with interest to the sportsman. This interest was much greater in the days of flint and steel and the early detonating locks, when guns were solely loaded through the muzzle. In this advanced age it is both interesting and amusing to read the trials and tribulations of a former race of sportsman. A century or so ago, one Colonel Thornton published an interesting account of an extensive sporting tour undertaken by him through the Highlands of Scotland, and he thus describes the sport obtained on one of the last days of his memorable progress.

"Day tolerable, but cold, and on the moors very windy. On this day I took my farewell of moor game, I found them very wild, and my fire being constantly blown from the powder, made it the most unpleasant day I ever had. After much walking, I determined to contend no longer against the weather, and returned homewards. At eight good shots my gun mist fire, though I put in five different flints: at as many bad ones it went off, and at some of them I killed."

Consider this, ye modern central-fire men, and be thankful that no amount of wind can disturb your ignition, neither can anything short of the supernatural in the way of rain damp your priming. It is extremely probable that muzzle-loading gunners were better acquainted with the strength, usefulness, and chief characteristics of gun-caps than are the general run of sportsmen in these days. This scarcely forms matter for surprise, as since the introduction of the central-fire cartridge and its further improvement, there has existed little need for inquiry, the whole arrangement for ignition being at least ready to the sportsman's purpose, if not, indeed, so invariably reliable as he might desire. Within recent years, however, there has been far less to grumble at upon the score of reliability, our cartridge-case makers having bestowed much attention upon the question of ignition.

In the early nitro powder days sportsmen experienced many drawbacks in the use of these new compounds, it being then most noticeable that as regards regularity of action they fell considerably behind their predecessor, black powder. These irregularities gave rise to much comment, and doubtless greatly retarded the freer use of the nitros; whilst blame was freely thrown here and there upon the powder manufacturers. Certain trials carried out by the *Field* newspaper, Mr. Chas. Borland of the E. C. Powder Co., and others, clearly established the fact that many faults were directly traceable to excessive variations in the strength of the caps. The gun-lock and its striker play a far more important part in the ignition of the cartridge than, perhaps, many sportsmen realize. And also it is true that the skill and time devoted in the designing of the cap, both as regards the quality of the metal used, the ingredients which form the cap composition, of which fulminate of mercury plays an important part, the proportions of the latter can be nullified to some extent by the relation of the cap to the chamber in which it is fitted. For instance, with a too tightly-fitting cap, and a weak striker, there may be hang-fires; with a weak striker and a cap-chamber low in depth, you may have a miss-fire.

Then again, the cap can also suffer from a high anvil, which, in the operation of capping, crushes or fractures the composition. This may again cause hang-fire or miss-fire. In the case of a low anvil and weak strikers, miss-fires are only too apparent.

As regards ignition of powders, this is a subject that claims attention, and a great amount of labour has been devoted to it. It is hardly necessary to point out to the most uninitiated that the different nitro compounds now on the market almost necessitate the designing of a cap specially suitable for each one of them. Some powders require a strong cap; others require heat and flame, and so on.

In discussing this question of percussion gun-caps with a practical cap manufacturer connected with the largest firm in this country, I am told that if the caps are produced according to the best accepted methods—and these methods are properly carried out with a due observance of the selection of materials and of their mixing—a good batch of caps is certain to result. As the alleged trouble with caps is but of isolated occurrence, there must be truth in this statement. Therefore, miss-fires, hang-fires, pierced caps, blow-backs, or gas escapes, are all due to the bad relation of the cap to its chamber, to strikers that are too weak, too powerful, too short, too blunt, or too pointed.

In high class guns these troubles will not arise; first, because the striker is made of the right length; and second, because the correct weight of blow has been provided by a due relationship of weight of spring to the stroke of the hammer.

As this standard of efficiency is guaranteed in first-class guns, so, I find it to be the case in regard to the caps and cartridges of the high-class ammunition maker. In this imperfect world, under conditions of the greatest skill and care, just as a striker may break on rare occasions, so may a cap prove weak or may even miss-fire once in a million times. In both cases common-sense recognizes that the manufacture of both the gun and the cartridge, nevertheless, may be of unexceptionable standard.

In the matter of the incompleteness of combustion of the powder charge there have been occasional growls to record. With some powders personal discomfort exists to some degree in respect of an excess of residue or of unconsumed particles which when firing in a vertical position or in a breeze fall or are blown back into the face and eyes of the shooter. The careful gunner rejects a powder of this nature, and this in large measure accounts for the introduction of the newer 33-grain nitros, in which type of explosives there is a lessening of the solid constituents. In this connection it may be noted that Kynoch, Ltd., claim to have entirely removed all blowback, their latest production in the way of a nitro powder leaving no residuum on combustion, and it, moreover, is practically smokeless. This important improvement will no doubt be fully appreciated by sportsmen.

Gunpowders.

At the present day sporting explosives, for use in the shot-gun, may be divided into four distinct classes as follows—

1. Black gunpowder.
2. Bulk nitro compound.

3. The intermediate form of semi-concentrated, or, as now often termed, 33-grs. nitro.
4. Condensed or concentrated nitro.

No. 1 on this list is, of course, our old and well-tried friend, black gunpowder, the original explosive, in fact, the only one possessed by the shooter until close upon forty years ago. Famous among black powders have been, and still remain, the "Diamond Grain" of Messrs. Curtis and Harvey, and the "Nonpareil" of Messrs. Kynoch, than which no more thoroughly reliable black powders are to be found in any quarter of the globe.

Black powder served the sportsman's purpose for a very extended period, the first really formidable rival being the nitro compound now familiarly known as "Schultze." To this explosive, in its original crude condition, was originally applied the title of "Sawdust" powder—a fitting term seeing that the powder presented the appearance of small rough particles of wood. This sawdust formed the basis or holding medium for the explosive chemical constituents. In subsequent years Schultze was altered considerably in form, as also in composition, its various particles were rendered round or granular, and were at the same time subjected to a treatment which rendered them both less compressible and less susceptible to the inroads of moisture. Since the advent of Schultze a host of new sporting explosives have been presented to the notice of the shooting public. Some have stood the test of time, others have sunk into oblivion.

With regard to No. 2 on the above powder list, we have as reliable and typical examples—

1. Schultze.
2. Amberite.
3. Kynoch smokeless sporting powder commonly designated K.S.

These powders give evidence of considerable elasticity under treatment, and in their behaviour within the gun-barrel are more nearly related to black powder than are the intermediate or 33-grain and the condensed or semi-condensed nitros. The term "bulk" has been applied to them by reason of the fact that they were designed to occupy the same space as black powders in the cartridge, though only half the weight. Thus, the normal 12-bore charge of any of the above weighs 42 grs. to the 84 grs. charge of black powder, and, measure for measure, are the same.

Under the heading No. 3 come the more recently introduced 33-grs. nitros. These include—

1. E. C. No. 3.
2. Imperial Schultze.
3. Diamond Smokeless.
4. Henrite.
5. K.S.G.

Class No. 4 comprises the condensed powders. Of these the charges proper to use are arbitrarily determined by the manufacturers. A typical example is—

1. Ballistite, of which the normal 12-bore charge is 26 grs.

With bulky powders the combustion is more or less continuous along the barrel. With the dense powders a different set of conditions prevails; in their case the combustion must be practically completed at or near the breech, as the reduced pressures further along the barrel will not so completely insure the combustion of dense powder grains not ignited by the cap flame.

Powder Pressures and Barrel Bursts.

The Housman Pressure and Recoil Gun is undoubtedly one of the most ingenious devices extant for the accurate recording of chamber and barrel pressures. As mentioned on page 123 this gun simultaneously registers pressures, at six different points along the barrel, and recoil as well. Whilst, further, in conjunction with the chronograph it assists in the taking of shot velocities. Thus, by making one conjoint function of these several services, far more accurate results are obtainable than was the case with previous methods where a separate instrument was needed for each operation.

Although a breech pressure of 3 tons per square inch has been very properly named as a safe working pressure in ordinary game guns, there can remain little doubt that in most of these guns of really good quality, this strain may be considerably exceeded without injurious effect. Assuming the general safety of all sporting powders, *i.e.* normal pressures with normal loads, and guns of sufficient strength to withstand them, the cause of burst barrels is undoubtedly due to some obstruction within the bore. Obstructions which have been proved to have strained or burst gun-barrels may be enumerated—

1. Turf, mud, wet leaves, and snow, etc.
2. A wad, or any other constituent part of the cartridge load or a part of the cartridge-case sticking in the barrel.

Foreign substances which characterize the obstructions included under item (1) result from lack of care upon the part of the sportsman or his servant, for it is difficult to imagine that such material could be received into the barrel without the shooter or loader knowing it. A man does not need to be very wide awake to keep an eye on this point. But undoubtedly it has happened to many sportsmen to fire their gun all ignorant of the presence of such an obstruction in the barrel, and with results more or less disastrous.

General opinion asserts that obstructions of this nature confine their effects to the muzzle end, or at all events so far forward of the breech as to remove risk of injury to the shooter's hand. This view has much experience to favour it. But in matters affecting the personal safety of the shooter, it is cold comfort to contemplate the law of averages. One can rejoice that ninety-nine Smiths have escaped with a whole skin, and so, happily, have contributed to such assuring statistics; but as Brown one may pardonably object to be the defunct or maimed exception to any rule.

Therefore, as it is conceivable that an obstruction which has entered by way of the muzzle may occasionally travel towards the breech end, and this is especially so with regard to snow and earth of a clayey or semi-liquid consistency, it is not safe to rely upon the view that would solely confine the effects of such obstruction to the muzzle end, or to any other position not likely to cause injury to the shooter.

The obstructions mentioned in item (2), *i.e.* from a wad, etc., are caused by defective cartridges, which may be summarized as consisting of cartridges without powder, or with shot charge omitted, cartridges charged with unreliable powder, or loaded cartridges with an imperfect cap. To these conditions are due imperfect ignition and non-ignition. Miss-fires, to speak correctly, occur only when the cap fails to explode, *i. e.* non-ignition of any kind. In this case no obstruction would arise, as no force would be generated against the cartridge load, and no movement of any portion of the charge would result from a miss-fire pure and simple; and therefore this condition, however annoying to the sportsman, does not enter into the consideration of burst barrels.

(1) In the case of an insufficient quantity of powder, (2) of bad powder in conjunction with a perfect cap, or, (3) of proper load of powder, and with an imperfect cap, there would only be partial ignition. This the sportsman would, under some circumstances, regard as a miss-fire, *i. e.* there would be no audible report, such as is given by a perfect cartridge, properly exploded. In other cases, the report would be faint and slack, and "plunk" on the ear like a stone dropped into still water, while at times it might be a mere fizzle.

The foregoing three examples of partial propulsion of the load are responsible for the lodgment within the barrel of a part or whole of the cartridge charge, which forms so highly dangerous an obstruction for the next cartridge, that in any case it is certain to damage the barrel, and, indeed, may burst it and so cause injury to the shooter. There still remains that other source of obstruction from a portion of the cartridge-case being blown by the explosion from the chamber into the barrel and left there.

Partial Combustion.

Partial combustion of the powder may fail to carry the shot charge out of the muzzle, while still developing force enough to dislodge it from the cartridge-case and leave it half-a-foot or so up the barrel. When this partial propulsion of the shot and wads is solely due to one of the two following causes—

(*a*) *Short powder charge.*—There is more likelihood of the contents of the cartridge being blown far towards the muzzle end, and, indeed, experiments have proved that when the powder charge reaches 5 grs., in nearly every instance, *but not in all*, as the experiments given will show, the whole of the contents of the cartridge are driven from the barrel.

Short powder charges, due to careless loading, which are more likely to occur with cheap than with the best ammunition, are responsible for a fair proportion of obstructions.

(*b*) *Bad powder, or powder difficult of ignition*.—In these cases, to the force of the cap we get the assistance of the force derived from the amount of powder ignited, and if the cap be of normal strength, the contents of the cartridge may be blown through the gun-barrel, but as to this nothing is certain. Bad powder, or powder difficult of ignition, or a cap too weak for a powder that was never intended for use with it, such conditions, present in defective ammunition, give rise to some of the most serious risks that the shooter is called upon to encounter. Occasionally the powder charge is not incompletely ignited, yet sufficient force is generated to drive the bulk of it, with the wads and shot, eight or nine inches or more along the barrel. On not a few occasions I have personally seen a considerable remnant of unconsumed powder grains left in the barrel, although wads and shot have in these cases left the muzzle. I have found by experiment that an obstruction consisting of the shot charge and wads remaining in the barrel $8\frac{1}{2}$ to 10 inches from breech does not burst, but only slightly bulges, the barrel on the firing of another cartridge. But under exactly similar conditions, when a powder charge of 42 grs. Schultze, laid like a train, was added to the obstruction of the wads and shot, the result on firing was a complete burst.

When shooting in the field, I have known many cases of obstruction, due to defective cartridges, some of which have bulged, slightly or seriously, whilst others have burst the barrels. In all cases the damage has been located seven to nine inches from the breech. The nature and position of such obstructions vary, but I am inclined to the belief that when a burst occurs from such obstructions, both a considerable portion of the powder charge and the shot wads are present in the barrel, and the following experiments support this view. In the case of—

Ignition only of Cap, without any Powder Charge.

Assuming that the cap is perfect, it has been asserted by some experimentalists that the force of the cap, when no powder is present, is alone sufficient to drive the wads and shot charge along part of the barrel. This may be so with a light turnover specially prepared for the purpose, as I have proved, but with an ordinary turnover there is practically no effect of the cap upon the contents.

Conditions vary, however, for the late Mr. R. W. S. Griffith, of the Schultze Gunpowder Company, who was one of the foremost authorities upon shot-gun ammunition, reported in the *County Gentleman* of November 23, 1901, that 1 gr. of smokeless powder placed on the top of the cap nearly always insures the shot leaving the barrel, though often the wads are left behind in the barrel, "but when the powder reaches 5 grs., in nearly every instance the whole of the contents of the cartridges are ejected from the muzzle."

These statements, true enough in his own experiments, cannot be accepted as of general application. They are not always borne out by my own experiments. In dealing with this question, it is unreasonable to assume that the odd grain of powder will lodge just upon the top of the cap. I have on repeated occasions fired a cartridge with only 2 grs. of powder, and also with 5 grs. placed in a haphazard way in the case, with the result that the shot charge and wads were driven only over a portion of the barrel, while 10 grs. inserted in the same way are, generally, only just sufficient to blow the shot out of the barrel, leaving the powder wads behind. I append here an account of a few experiments concerning this important question.

Account of Experiments.

(Barrel: Westley Richards special steel—tensile strength, 33 tons; elastic limit, 19 tons; elongation in 4 inches, 26·2 per cent.)

TEST.

(Shot tube, choke, 12 gauge, of usual game gun weight, *i.e.* 1 lb. 7 oz., 30 inches long.)

1. In order to foul the barrel six shots of ordinary Schultze were first fired through.

2. A charge of shot, 1⅛ oz. No. 6 chilled, with usual wads in position, *Field*, felt, and card; and card over shot, were placed in the barrel. The *Field* wad was 8½ inches from breech; the over-shot wad 10 inches from breech to form an obstruction such as might be left within the barrel from a defective cartridge, either due to a faulty cap or to the omission of the powder, which has been known to arise in imperfectly-loaded cartridges.

Fig. 65.—Barrel Bulged ·014, 9½ Inches from Breech.

3. With this obstruction present, an ordinary cartridge, 12 gauge, loaded with 42 grs. Schultze powder and 1⅛ oz. No. 6 shot, same wads, was fired from the barrel.

Result—A bulge took place 9½ inches from breech. The height of the bulge from the level of the bore measured ·014 inch, viz.—

Diameter of bore	·735	before firing
,, outside	·826	before firing
,, to summit of bulge outside	·840	
Height of the bulge =	·014	

5. This test, as compared with the *Field* trial with Poldi steel

barrel made November 1, 1902, shows the superiority of Westley Richards steel. The *Field* barrel measured before firing—

External diameter . .	·875
Summit of bulge . .	·970

Height of the bulge = ·095

The *Field* placed their obstruction 16 inches from breech.

Trials of cap only and no powder; and also with 2, 5, *and* 10 *grs. of powder.* (March 21, 1905. Gun, No. 16174.)

1. Diamond case, medium cap, *no powder*, wads and shot charge in usual position.

2. Pegamoid, special cap, *no powder*, wads and shot charge in usual position.

Result—Failure to even open turnover, it only being slightly disturbed.

3. Pegamoid special cap, 2 *grs. Schultze*, wads and shot with turnover as usual.

Result—Charge driven $6\frac{1}{2}$ inches up the barrel; the charge occupied $1\frac{1}{2}$ inches—*i. e.* end of charge 22 inches from muzzle of a 30-inch barrel, cylinder.

4. Pegamoid special cap, 5 *grs. Schultze*, usual wads and shot as above.

Result—Drove shot charge up choke barrel 21 inches; end of charge $7\frac{1}{2}$ inches from muzzle; charge left occupying space of $1\frac{1}{2}$ inches as before.

5. Pegamoid special cap, left barrel choke and 10 *grs. Schultze*, usual wadding, etc., as above.

Result—Just dropped the shot 25 yards away; gun fired level with elbow and shot dropped at distance named with little or no force. It left in the barrel a felt and two card wads; first wad $28\frac{1}{4}$ inches from breech, card wad 1 inch from muzzle. The over-shot wad was not driven out but rested endwise on the card wad immediately over the felt.

6. *U. M. C. Co.*, Ballistite special cap, 2 *grs. Ballistite*, usual wads and shot, left choke.

Result—Blew charge up the barrel, first wad $3\frac{3}{4}$ inches from breech end, wad 20 inches from muzzle. Wads and shot occupied $6\frac{1}{4}$ inches; shot wad slightly turned, no shot escaped.

7. Ballistite, 5 *grs.*, usual wads and shot.

Result—First wad $22\frac{3}{4}$ inches from breech, shot wad 2 inches from muzzle; charge occupied space of $5\frac{1}{4}$ inches.

8. 10 *grs. Ballistite*, usual wads and shot.

Result—Fired all right with fair report, and shots reached the target 40 yards distant.

Trials solely without powder. (March 24, 1905.)

"Diamond Smokeless" cartridge-case, medium cap, 12 gauge.

1. No powder, ordinary wads, and $1\frac{1}{8}$ oz. No. 6 shot.

2. No powder, ordinary wads, and $1\frac{1}{8}$ oz. No. 6 shot.

Result—Slight disturbance of turnover only.

1. Nitro cases, 12 gauge as above.

Result—Slight disturbance of turnover.

2. Nitro case, 12 gauge as above, with a slight turnover, almost imperceptible.

Result—Card wad, shot, and card wad driven $3\frac{1}{2}$ inches up barrel, the felt wad only forced to end of cartridge-case.

3. Pegamoid, 12 gauge as above, ordinary turnover.

Result—Slight disturbance of turnover.

4. Pegamoid, 12 gauge as above, with very light turnover.

Result—None of contents driven from case.

5. Ballistite case, 12 gauge as above.

Result—Less disturbance than any.

6. Ballistite case, 12 gauge as above, no turnover.

Result—Wads not driven out although card shot was forced to the end of the case.

Report on the effect of wads in gun-barrels. (March 31, 1905.)

(*a*) 12 gauge single barrel, bored ·734/·690, choke. Obstruction consisting of regulation wadding and shot load placed 21 inches from the breech. Ordinary 12 gauge Schultze cartridge with $1\frac{1}{8}$ oz. shot was then fired.

Result—Large burst, rent 2 inches along one side of the barrel, at 22 to 24 inches from the breech (*vide* Fig. 66).

(*b*) 12 gauge single barrel, bored ·734/·690, choke. Obstruction consisting of 12 grs. Schultze powder with regulation wadding and shot load was placed at 28 inches from the breech. The gun was then fired with regular 12 gauge Schultze cartridge and $1\frac{1}{8}$ oz. shot.

Result—The barrel bulged, a ring $\frac{1}{10}$ inch larger than diameter of the barrel formed at 28 inches from the breech (*vide* Fig. 67).

Fig. 66.—Burst Barrel.

(*c*) 12 gauge barrel, bored ·734/·690. Shot with 12 gauge Schultze cartridge, previously placing the wads at $28\frac{1}{4}$ inches, the over-shot wad lying transverse to the bore, the shot lying loose.

Result—The barrel showed no effect from this.

The omission of powder altogether, one would at first blush think, is of more likely occurrence than a partial omission, *i. e.* an

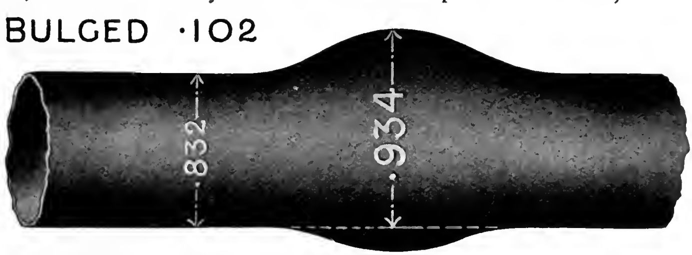


Fig. 67.—Barrel Bulged ·012, 28 Inches from Breech.

error whereby only a few grains of powder would be placed in the cartridge-case. Complete absence of powder from the cartridges, with caps of normal strength, as we have seen, is not a cause of obstruction. The presence of only a few grains, as proved, is a possible cause of obstruction, and, indeed, the latter condition is more likely to arise in the loading of cartridges. The machine through which the allotted charge is transmitted into the cartridge-case may be faulty, clogged, or in some way defective. In such circumstances, the whole charge is not completely excluded, a few grains or so would certainly get through, and this I consider is one of the more likely sources of obstruction due to defective ammunition.

Under those conditions which would produce a burst in a Damascus barrel, experience teaches that a steel barrel would be less likely to give way. Although I have given an account of a Damascus barrel which only bulged under an excessive strain, it must not be inferred that this constitutes any sort of guarantee as to the general behaviour of Damascus barrels or steel barrels under stresses of an exceptional character, which ought not to exist, but unfortunately have to be contended against. The employment of properly-loaded cartridges, primers, and powders, having regularity of performance certified during an extended period of public service, would considerably assist towards the elimination of mishaps and accidents to barrels, and possible injury to the sportsman, which, although rare, we still hear of from time to time.

Foreign cases are largely used in this country, and, frequently, sportsmen are induced on account of their cheapness to patronize them, and, I am afraid, in most cases without reference to their efficiency or safety. The powder used in them may never have been heard of by their maker, and, in any case, the complete cartridge is a nondescript, powder and cap being an ill-assorted couple best apart. Sportsmen would do well to eschew these cheap and unsatisfactory cartridges, and make it an axiom of their policy and practice—"Best cartridges for best guns."

Safety, reliable shooting results, and general efficiency, depend as much upon the cartridge as upon the gun, and my advice to all sportsmen is that, whatever the gun may be, be it a cheap farmer's quality or the highest production of a first-rate gunbuilder, always use the best ammunition. There may be some excuse for the owner of the former class of guns, who has only occasional shooting, and is, therefore, inclined to think that the cheaper cartridges will serve him well enough. In any case, it may be that he fires too few cartridges for his gun to be affected by the ammunition to a serious extent, whereas the owner of the higher grade gun has no such excuse, and it does seem to be a lack of consistency to spend a large outlay on an expensive gun and then to use for this carefully-constructed weapon cheap ammunition of inferior guarantee. It is false economy, and little doubt can be entertained that the causes of bursts and damaged barrels, to which I have referred, would be, to a large extent, minimized by the use of only the highest standard of ammunition. It need not be the dearest of its kind. Standard ammunition is generally sold at a standard price. In a cartridge of this class each component part is well adapted to the whole, and cap, wad and powder being well suited one to the other, produce an unfailing and reliable ignition, combustion and propulsion, upon which so much depends for effective shooting.

I should like to offer another piece of advice, and I think it may be stated as a golden rule, viz. that before loading the gun, either when beginning to shoot or during shooting, the barrels should be looked through previous to the insertion of the cartridge. This is a habit that soon becomes familiar, and causes no delay in shooting. Generally speaking, a glance down the barrel after shooting takes up almost no time, and this applies equally to shooter or loader. I have observed that this practice is already followed by a large number of shooters, but not so generally as is thoroughly consistent with safety. It is, I have noticed with interest, the invariable rule of gunmakers to look through the barrels before inserting a cartridge into any weapon, and from personal experience I can say as a sportsman, when once the habit is acquired, it may be continued unconsciously. If this were habitually done, accidents from obstructions could never arise.

Shot Velocity.

In the course of my investigations relative to the processes of manufacture, loading, and testing of cartridges at Witton, I found that Kynoch, Ltd., carry out three important tests for ascertaining shot velocities in the following respects—

1. Time up the barrel.
2. Average speed over the first 10 yards from the muzzle.
3. The velocity at 30 yards.

The first chronographic test registers the extremely short interval of time occurring between the impact of the striker upon the cap and the passage of the shot to the muzzle of the gun. It will be seen that this test not only records the speed of the shot up the barrel, it also affords most valuable information relative to the reliability of the primer, as evidenced by the rate of ignition and the speed of combustion of the powder. It has been found that the time occupied by the shot in passing along the barrel should approximate to ·005 second if the best and most serviceable results in the way of shot propulsion are to be insured in a manner that is most agreeable to the shooter.

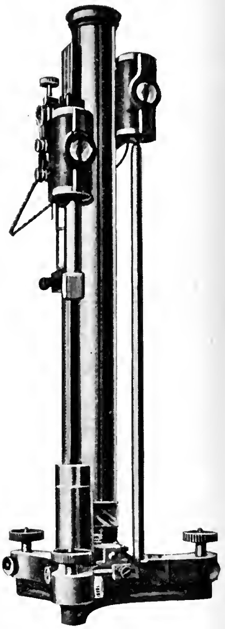


Fig. 68.—The Kynoch Chronograph.

The measurement of periods of time so remarkably minute of necessity involves the employment of electric time-recording instruments of absolute and inviolable sensitiveness and accuracy. This the old form of chronograph was not; therefore Kynoch, Ltd., have planned and provisionally patented a new type of instrument which will register spaces of time so short as the two-hundredth part of a second with much greater precision than its predecessor.

The second test, above mentioned, ascertains the average velocity of the shot over the first ten yards from the muzzle of the gun. As a powder test this, too, is of great value, as at this short distance the value of the records has less chance of being impaired by such influences as the stringing out of the shot charge and the deformation of individual pellets.

The third on the list may be regarded as a test of the actual killing power of gun and cartridge. It is a chronographic record of the time taken by the shot whilst travelling over the space of five yards at an average distance of thirty yards from the muzzle of the gun. Velocity tests conducted at this distance, taken in conjunction with records of the pattern of the shot, afford valuable data for the sportsman.

As ascertained by the chronograph, and recorded in the *Field* newspaper, the velocity imparted to a charge of No. 6 shot, by modern nitro powders, and 12-bore game guns of the day, is about 1050 feet per second over a distance of 20 yards, the muzzle velocity being some 200 feet higher. This has been termed the *Field* standard.

If there is one thing more than another that has forcibly struck the average sportsman with regard to the press reports of powder trials in recent years, it is the remarkable unanimity of results displayed. The reports have made all powders, English and foreign, practically equal in the race for supremacy—in fact, like the contestants in the memorable race in *Alice in Wonderland*, they have all been awarded prizes, and first ones at that. The sportsman has been left to assume that there is little to choose between them in the matters of pressure, velocity, pattern and distribution of the shot, penetration, absence of smoke, fouling and recoil. This reminds one of the old toper's pronouncement relative to his favourite beverage, said he—"There is no bad beer, only some's better than others." The experienced sportsman knows, however, that powders vary considerably in behaviour. Although he be ignorant of chronograph, pressure gauges, or other instruments in the scientific equipment of the laboratory expert, he rightly retains a common-sense belief in certain powders whose superiority has been demonstrated at practical work in the field.

Quite recently I read the statement—"On the whole, however, it may be said that nearly all powders are alike." As a practical field sportsman, and having myself carried out numberless experiments with guns and loads, I must say that this is distinctly at variance with my experience. I grant that they may appear to be alike inasmuch as they may have been loaded expressly to conform to an ideal with regard to a 3-ton breech pressure, and the 1050 feet per second velocity set up by the *Field* and others. Such ideal may or may not show a powder at its best, and to set up a breech pressure of 3 tons per square inch and a velocity of 1050 feet per second over 20 yards as absolute and impassable standards can only be likened to the imposition of a barrier to all progress.

Progress, however, as a force is irresistible, and refuses to be stayed, just as the incoming tide refused to be stayed at the bidding of Canute. When in conversation, some years ago, with a well-known gunmaker, I happened to suggest that shot velocities might be accelerated with advantage. I was much struck with the answer I received. This was to the effect that velocities were high enough, that to increase them would probably result in the upsetting of the gunmaker's and cartridge manufacturer's arrangements, that game already was killed at ranges sufficiently lengthy, and —well, let well enough alone. Fortunately all do not stagnate under a like policy, the truest conservatives have ever been progressive.

Chronographic records of velocity taken over distances so short that No. 1 shot is given pretty nearly the same value as No. 6, do not convey much practical information to the sportsman with regard to the *penetrative* values or ranging power of the shot. He knows that whilst these records may be practically on an equality, they do not convey in even approximate degree information as to the relative shot energies, for the larger shot will be killing well and cleanly at ranges long past the point where the small shot had lost its effective velocity.

On reading W. W. Greener's book, *The Modern Shot Gun*, I was much surprised to find so practical a gunmaker completely misapprehending the value of chronographic records in relation to penetration. He states that "a velocity of 700 feet is equal to a penetration of 36 sheets (Pettit's pads) with No. 6." He informs us that the actual mean velocity of a charge of No. 6 shot fired from a 12-bore gun, is 723 feet per second at a range of 60 yards, as measured by Mr. R. W. S. Griffith, and published in the *Field* newspaper. If Mr. Greener or any other gunmaker can build a 12-bore gun to penetrate 36 sheets of Pettit's pads at 60 yards, with a loose charge of No. 6 shot, even though using *ad libitum* powder charges, I shall be exceedingly pleased to purchase that gun at an enhanced price. As this estimate is probably three times in excess of what may be accomplished in the way of actual penetration of Pettit's pads, at the 60 yards range, it will be seen how utterly futile and misleading are all such computations as to *penetration* based solely on calculated proportions of the sort. The perfect test from the sportman's standpoint would be that in which pattern and penetration were registered simultaneously at practical killing ranges. The taking of records of penetration at killing ranges is in the highest degree essential, if we are to ascertain with any degree of accuracy the true value to the sportsman of the shooting of any gun or cartridge.

Shot.

One frequently hears people discussing the question of small shot with far greater volubility than acumen. They run the whole gamut of sizes, and can tell you exactly how many pellets are contained in 1 oz. of each; they extol the merits of No. 6, of No. $6\frac{1}{2}$, and having selected a size to suit their special requirements, they think that everything necessary to success has been secured in respect of the missile section of their armament. More care than this must, however, be exercised if it is desired to insure accuracy and uniformity in shooting results, both at the target and in the way of game killing. In order to insure, as far as possible, regularity of shooting, and deadliness of effect at all practical ranges, the following main qualifications are necessary in all shot—

1. Perfect sphericity.
2. Evenness of size.
3. A good degree of hardness.
4. Smoothness of surface.
5. A high polish.

These are the main essentials, the due observance of which render the pellets serviceable to their fullest capacity. I will consider these desiderata in the order given.

1. Sphericity.—Pellets must be round in order to possess in maximum degree, in proportion to weight, accuracy of flight and extent of ranging power.

2. Evenness of size is important, for with a shot charge of mixed sizes the smaller pellets lag behind in flight, consequently all do not reach the object with precision, and the destructiveness of the charge is minimized. This effect will not be observable when shooting the gun at a target, as the pattern displayed upon a plane surface will not reveal this defect; this tailing off will, however, certainly tend to reduce the sportsman's percentage of kills,

particularly where the shooting is undertaken at lengthy ranges and strong game.

3. Hardness.—Personally I prefer chilled shot, because pellets of this nature withstand much better than soft shot the tremendous impact of the powder explosion, the friction against the bore of the barrel, and the violent hustling and compression received in passing through the cone, and in the case of a choke through the constricted portion of the barrel. Crushing of the pellets exists in greater or lesser degree with all guns as now bored. This deformation is much accentuated in the case of soft shot. Mr. Leslie Taylor (Westley Richards) is now concentrating a considerable amount of attention upon the boring of guns in a special way in order to mitigate the evil, or practically remove this hindrance to good shooting. This means much to the sportsman ; any considerable reduction in the number of malformed, ill-flying pellets would result in a far greater percentage of game being brought to hand. Moreover, such game would be killed outright instead of merely wounded, and afterwards chased half-way across moor or manor before capture.

To place 300 round pellets in a 12-bore and promptly knock 100 or so of them out of shape and all resemblance to their original condition is a pure waste of energy and material. If any one will carry out the simple experiment of counting the number of pellets contained in his, say, No. 6 shot cartridges, and will then fire at a target 6 feet square at a distance of 50 yards, he will find that some pellets are missing when the marks on the target are totalled up. From some cause or another the missing ones have not been able to preserve a course sufficiently straight to enable them to reach even a target 6 feet square. Probably they are the battered and flattened pellets that have flown off at a tangent. These are the missiles which cause those seemingly unaccountable accidents in the shooting field, sometimes wounding man or dog, that but for the erratic flight of such shot would have been well out of the danger zone of fire. To reduce the number of such accidents will in itself be an achievement worthy of highest commendation, whilst to reduce the number of deformed pellets in marked degree must have for its result a most valuable increase in the efficiency of the shot-gun.

4. Smoothness of surface tends to accuracy of flight, whilst (5), a high polish, the result of the application of plumbago or blacklead, acting as a lubricant, reduces friction upon the shot and minimizes the injury received in its passage through the barrel. Shot sizes vary considerably in the count as turned out and numbered by the different makers. Some variation in this respect may also be noted in the different batches put up by any single firm of manufacturers. When perfect accuracy of results is desired whilst comparing one set of target experiments against another, it is imperative that the number of pellets per ounce should be ascertained.

The following list gives the numbers and count of pellets in an ounce of each size of shot as numbered and turned out by one of the best-known British shot manufacturing firms, Walkers, Parker & Co., London and Newcastle—

PATENT SHOT

Compressed and Moulded Buck-shot.

Size.	Pellets per ounce.	Size.	Pellets per ounce.
LG	4½	SSG	13¾
MG	6	SSSG	19⅜
SG	7½		

Drop Shot.

AAA	36	5	220
AA	41	5½	240
A	44	6	270
BBB	51	6½	300
BB	55	7	345
B	64	8	450
1	79	9	600
2	96	10	800
3	119	11	1000
4	173	12	1200
4½	200		

The above is that known as soft shot. This firm having taken over the business of the original makers of the "Pyramid" brand of Newcastle chilled shot now manufacture this also in the sizes as given below—

NEWCASTLE CHILLED SHOT.

Size.	Pellets per ounce.	Diameter in millimetres.
AAA	40	5·0
AA	48	4·75
A	56	4·50
BBB	64	4·25
BB	84	4·0
B	98	3·531
1	104	3·50
2	122	3·25
3	140	3·125
4	172	3·0
4½	200	2·89
5	218	2·75
6	270	2·50
7	340	2·25
8	450	2·0
9	600	1·875
10	800	1·75
11	1000	1·50

Another English firm, one which claims to be the only one in Great Britain devoting the whole of its time to the making of shot, is the Abbey Improved Chilled Shot Company, of Newcastle-on-Tyne. Appended is this firm's schedule of sizes—

Size.	Pellets per ounce.	Size.	Pellets per ounce.
LG	6	3/B	66
SG	8½	2/B	84
SSG	11	B	98
SSSG	15	1	104
3/A	40	2	122
2/A	48	3	140
A	56	4	172

Size.	Pellets per ounce.	Size.	Pellets per ounce.
5	218	9	580
$5\frac{1}{2}$	240	10	850
6	270	11	1040
$6\frac{1}{2}$	300	12	1250
7	340	D	2600
8	450		

Another old-established firm of shot manufacturers is Cox Bros., of Derby. As the sizing of this firm's shot differs from that of the others named it may prove useful to give the figures, which are as follows—

MOULD SHOT.

Size.	Pellets per ounce.	Size.	Pellets per ounce.
LG	$5\frac{1}{2}$	LM	14
MG	$8\frac{1}{2}$	SM	17
SG	11	2/A	27

PATENT SHOT.

2/S	48	$5\frac{1}{2}$	240
S	57	6	270
2/B	77	$6\frac{1}{2}$	300
B	89	7	340
1	104	8	450
2	122	9	580
3	140	10	850
4	172	12	1040
5	218	Dust	1760

The table (p. 160) of the American sizes of shot may prove of some service to sportsmen anxious to compare notes, or who may be shooting on the other side of the water.

In various countries on the Continent shot sizes differ considerably as between each other and our manufacturers' sizes. It is probable, therefore, the table on p. 161 may be useful to sportsmen contemplating shooting in the countries named.

Number of Pellets to an Ounce of Shot.

Size Shot.	Tatham Brothers, New York.	Le Roy Shot and Lead Co., New York.	Colwell Lead Co., New York.	Chicago Shot Tower Works, Chicago, Ill.	Raymond Lead Co., Chicago, Ill.	Sportsman's Shot Works, Cincinnati, Ohio.	Gulf Shot and Lead Works, New Orleans, La.	Omaha Shot and Lead Works, Omaha, Neb.	Collier Shot Tower, St. Louis, Mo.	Thomas W. Spark, Philadelphia, Pa.	The James Robertson Mfg. Co., Baltimore, Md.
Fine Dust	10784	—	—	—	—	—	—	—	—	—	—
Dust	4565	—	—	—	—	—	4565	—	—	5910	—
12	2326	1963	2326	2812	2400	2326	2326	3248	2400	3316	2024
11	1346	1345	1346	1577	1414	1346	1346	1510	1414	1660	1406
10-Trap	1056	1052	—	—	—	—	—	—	—	—	—
10	848	842	848	1012	854	848	848	896	854	950	903
9-Trap	688	698	—	—	—	—	—	—	—	—	—
9	568	560	568	610	596	568	568	680	596	615	623
8-Trap	472	473	—	500	—	—	—	—	—	—	—
8	399	400	399	476	434	399	399	456	434	426	457
7-Trap	338	337	—	425	—	—	—	—	—	—	—
7	291	286	291	363	323	291	291	338	323	305	350
6	218	209	218	251	216	218	218	248	216	245	250
5	168	157	168	205	172	168	168	187	172	182	193
4	132	125	132	157	146	132	132	143	146	130	150
3	106	98	106	120	118	106	106	128	118	118	119
2	86	82	86	99	92	86	86	100	92	90	98
1	71	69	71	77	75	71	71	81	75	80	79
B	59	58	59	62	62	59	59	65	62	63	67
BB	50	49	50	53	53	50	50	56	53	55	57
BBB	42	41	42	46	46	42	42	48	46	48	48
T	36	35	36	—	—	—	—	—	—	41	37
TT	31	31	31	—	—	—	—	—	—	36	32
TTT	—	27	—	—	—	—	—	—	—	—	28
TTTT	—	24	—	—	—	—	—	—	—	—	—
0	—	—	—	39	38	36	36	42	38	—	—
00	—	—	—	34	33	31	31	37	33	—	—
000	—	—	—	29	27	26	27	30	27	—	—
F	27	—	27	—	—	—	—	—	—	22	—
FF	24	—	24	—	—	—	—	—	—	—	—

FRANCE.						BELGIUM.		ITALY.		AUSTRIA.		PRUSSIA.	
PARIS.		MARSEILLES.		LYONS.		BRUSSELS.		GENOA.				COLOGNE.	
Size.	Pellets per oz.	Size.	Pellets per oz.	Size.	Pellets per oz.	Size.	Pellets per oz.	Size	Pellets per oz.	Size.	Pellets per oz.	Size.	Pellets per oz.
000	40	0000000	28	0000	28	0000	23	00000	49	00	21	0	2 to 3
00	50	000000	33	000	30	000	33	0000	53	0	23	00	3 to 4
0	60	00000	35	00	33	00	39	000	54	1	26	000	4 to 5
1	74	0000	39	0	34	0	45	00	64	2	31	0000	5 to 6
2	81	000	49	1	37	1	56	0	87	3	35	AAA	19
3	90	00	54	2	43	2	69	1	102	4	41	AA	26
4	108	0	62	3	53	3	79	2	141	5	50	A	29
5	189	1	71	4	81	4	128	3	146	6	59	BB	38
6	214	2	75	5	86	5	169	4	156	7	69	B	43
7	262	3	97	6	178	6	216	5	162	8	82	1	50
8	337	4	114	7	184	7	268	6	193	9	92	2	64
9	686	5	144	8	261	8	—	7	268	10	124	3	82
10	988	6	150	9	443	9	—	8	308	11	155	4	97
		7	190	10	721	10	1052	9	395	12	203	5	123
		8	229	11	1254			10	527	13	283	6	167
		9	312	12	2218			11	714	14	303	7	230
		10	485					12	1114	15	652	8	336
		11	920					13	2278	16	809	9	442
		12	1177									10	696
												11	1223

As lead varies in density, slight variations from the standards set up by shot manufacturers are ever liable to occur, and this notwithstanding the most careful screening and sizing of the shot.

CHAPTER VII

MODERN SPORTING RIFLES

LONGITUDINAL rifling, that is to say, straight or parallel grooving, was invented in the sixteenth century, according to Lieut.-Colonel Hardy, of the Musée d'Artillerie, Paris, and other authorities. The spiral grooving now in general use, from all evidence to hand, was a subsequent adoption. Fremantle, in his *Book of*

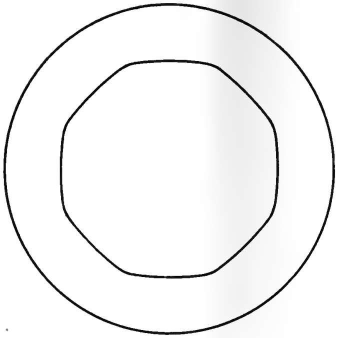


Fig. 69.—Whitworth Rifling, 8 Grooves, ·450-Bore.

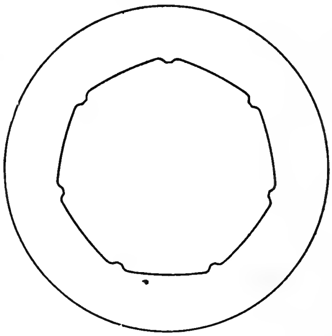


Fig. 70.—Henry Rifling, 7 Grooves, ·450-Bore.

the Rifle, is of the opposite opinion, but does not prove his case. He, like other writers, alludes to the use of rifling at the outset being employed to receive fouling. But that alone was not the purpose of grooving the barrel. In smooth bore weapons, the ball was supposed to be driven to one or the other side of the barrel, which was said to give it a deflection in one direction or another, and the longitudinal grooving was instituted in order to prevent this bias.

In an old work entitled *An Essay on Shooting*, which I have before me, we read: "To correct this bias, the only means . . . is by giving to the ball a motion which will counteract any

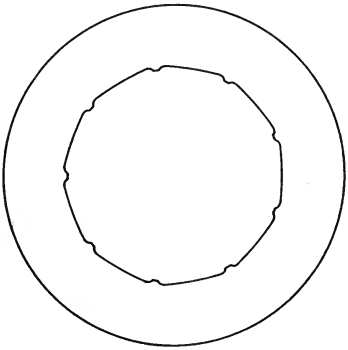


FIG. 71.—HENRY RIFLING, 9 GROOVES, ·450-BORE.

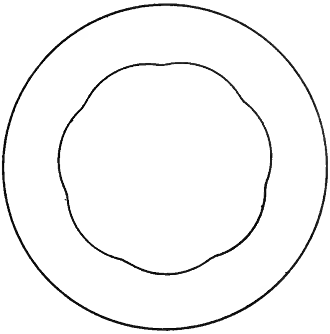


FIG. 72.—METFORD RIFLING, 7 GROOVES, ·458-BORE.

accidental one, and will preserve its direction by making the resistance of the air in its fore part continue the same in every

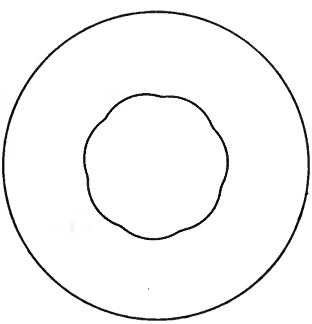


FIG. 73.—METFORD RIFLING, 7 GROOVES, ·303-BORE.

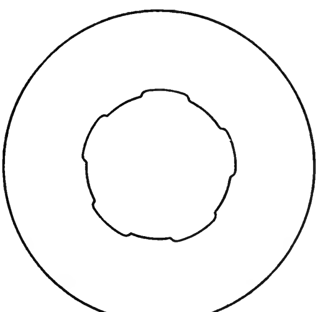


FIG. 74.—ENFIELD RIFLING, 5 GROOVES, ·303-BORE.

part of the flight. The contrivance for this purpose is termed 'rifling,' and consists in forming, on the inside of the barrel, a number of furrows either in a straight or spiral direction. . . . Barrels of this construction have been in use on the Continent since the middle of the sixteenth century. The spiral rifle barrels, however, have entirely superseded the straight rifle barrels, because, although the latter prevented the rolling motion of the ball, yet they do not communicate any other motion that could serve to correct the variations that may occur during the flight."

It seems incredible, if spiral grooving were the first attempt in rifling, that builders of rifles should have changed afterwards to the straight form, thus abandoning the spiral, which gave them all the longitudinal groove provided and something in addition. Both authority and common-sense join in the opinion that straight

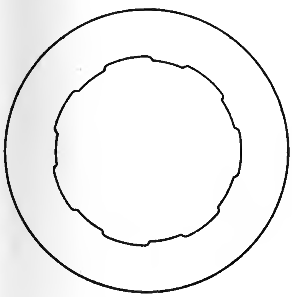


FIG. 75.—HIGH-VELOCITY NITRO EXPRESS RIFLING, 7 GROOVES, ·360- AND ·400-BORES.

grooving preceded the spiral form which besides providing place for fouling and steadying the projectile, also made progress in spinning the projectile for the purpose of further increasing its flight.

Judged by modern standards, muzzle-loading sporting rifles and early breech-loaders were poor weapons. The best of them had but short range, high trajectory, and inaccurate flight of bullet—three points of vital importance to the sportsman which urgently needed the special attention of the gunmaker.

Any rifle which proves itself superior to another in one, or in all of these important qualities, thereby becomes the more serviceable for the pursuit of game. It is possible with a given *limited range* to have a high trajectory curve with an excellent standard of accuracy ; or lower trajectory with a lesser degree of accuracy at this range.

On the other hand, accuracy may be even increased, *i.e.* a longer ranging power insured, without flattening the trajectory of the bullet, whilst at the same time retaining killing power to the full distance of the rifle's capacity.

1. Let us take the muzzle-loading rifle, shooting in comparison with its bullet a light charge of powder, in which case we have high trajectory and comparative accuracy.

2. Take an ordinary black powder express rifle with its light bullet and heavy powder charge, and here we have a flatter trajectory, but with some decrease of accuracy, within a limited sporting range. An extension of this principle by which the same weight of bullet is retained with an increased powder charge, while giving a still flatter trajectory, results in a further reduction of accuracy.

3. Or we may also assume the same lines of construction as exemplified in No. 1, and, instead of increasing the powder charge alone, increase also the weight of the bullet proportionately, by which we obtain—without flattening the trajectory—greater ranging power and accuracy of flight, which cannot be obtained by the methods adopted in the other examples mentioned.

Thus, briefly stated, these examples may be said to mark out the main lines of difference between the sporting rifles used by our ancestors. Individual makers occasionally might use special charges of powder and certain weights of bullet, so modifying to a slight degree the features of these individual types or combine, to a certain extent, the ranging power of the one and the flatter trajectory of the other, which permitted a degree of accuracy then regarded as sufficient for sporting purposes.

In designing rifles for purposes of sport, the following may be cited as the main considerations from the sportsman's standpoint—

1. Safe Construction . . . *i. e.* Barrels and action of sufficient strength and substance to be safe with all charges and under every condition of usage.

2. Easy Manipulation 3. Barrel Length	These, with the next two considerations, are the chief factors towards insuring handiness.
4. Balance	Equalling that of the high-class shot-gun.
5. Weight	As light as may consistently assure due strength of parts and accuracy of shooting.
6. Reliability of Mechanism	Insuring against double discharges, premature explosions, miss-fires and hang-fires.
7. Simplicity of Mechanism	Insuring ease, speed, and durability in working.
8. Sighting	Simple, efficient, and quick to adjust.
9. Accuracy of Shooting	At all ranges to which the rifle is sighted and regulated.
10. Bullet Efficiency	Penetration and shock-giving properties duly apportioned for the work in hand.
11. Trajectory	Bullet velocity high, so that its trajectory—*i. e.* curve of flight—may be as flat as possible, consistent with accuracy and other sporting needs.
12. Recoil	As light as may be consistent with securing high bullet energies. With double rifles lightness of recoil is of greater importance than with single rifles, that is, if prompt and due efficiency with the second barrel is to be secured.

EXPRESS RIFLES.

The terms "Express" and "High-Velocity" as applied to rifles are more or less synonymous. At their best both appellations are somewhat vague. In the first place, they apply rather more to the ammunition than to the rifle; whilst in the second, they do not fix with any degree of precision the rate of speed of a bullet's flight. The name "Express" was first given to rifles in the muzzle-loading black powder era, the bullet velocity necessary to assure such title being at least 1600 feet per second. This rate of speed was secured by the employment of heavy powder charges and light bullets, the proportion as regards weight of propellant and projectile being about one of powder to four of lead. The early forms of Express rifle shot well up to 100 yards. Beyond this distance they were not so reliable, as, by reason of the form and lightness of their bullets, velocity rapidly diminished and accuracy suffered in consequence.

The object of the projectors of the "Express" rifle was both to secure flatter trajectory, so minimizing the sportsman's errors in estimating distances, and greater bullet expansion with corresponding increase of deadliness.

Since the term "Express" rifle first came into prominence in the sporting world, there have been launched innumerable variants from the first examples. If I mistake not, Purdey was the first gunmaker to apply the cognomen "Express"—"express train" I believe he called it—since when, rifles termed "Express" have been made in all bores ranging from ·256 to ·600. These "Express" rifles very properly may be divided into three classes, as follows—

	Velocity.
1. Black powder express rifles .	1600 to 1950 feet per second.
2. Cordite, or other nitro-compound, high-velocity rifles .	1800 to 2200 feet per second.
3. Axite powder accelerated velocity rifles	2200 to 2700 feet per second.

This latter type of rifle was first introduced by Messrs. Westley Richards, and the title of "Accelerated Express" applied by that firm, very happily describes its prominent characteristics.

The old Snider is a good example of a rifle which has a long ranging power and a high bullet curve. This weapon has proved itself effective as a sporting arm in various parts of the world.

In contra-distinction to this type, the old ·450-bore rifles and other calibres, constructed on what is now known as the "Express" system, may be instanced as examples of weapons possessing a flat bullet curve and limited ranging power. The standard of excellence the practical gunmaker of the past set himself was frequently incapable of attainment, owing to physical conditions which have since been altered or improved. He had to encounter excessive fouling, which resulted from the use of black powder and lead bullets.

Hence we read that an admirable rifle designed in 1865 by Mr. Purdey, of less than 100-bore (practically ·360-bore) although proving most effective, was not adopted because its fouling was excessive. As a matter of fact the high express velocities obtained in those days were in advance of the practical acquirements of the time, being incompatible with the nature of the explosives and the form of projectile then available, even though a slow pitch of rifling was employed to rotate the bullet.

Had it been practicable, gunmakers of that day would have employed a quicker pitch of rifling, but the soft material of lead of which the bullet was composed rendered it impossible to drive such a bullet at a high velocity through a barrel having a quick spiral twist of rifling.

The chief difficulty which had to be met was the stripping of the lead bullet within the bore, and so clogging up the barrel; but for this, a bullet of weight and length proportioned to its diameter and a suitable powder charge with which to propel it, would doubtless have been arranged, and so would have made the express rifle of the past answer to its name, not only in flatness of trajectory, but in ranging power and accuracy. These, briefly expressed, were the limitations within which the gunmaker of forty years ago was permitted to work.

Despite all this, the ·450-bore sporting and target rifle was developed to a degree of efficiency which might be considered remarkable, considering that this class of rifle had to shoot the lead bullet and black powder.

Conspicuous amongst this type of weapon were the Martini and

Westley Richards No. 2 Musket Rifles. The former using 85 grs. black powder and 480 grs. bullet; and the latter 76 grs. black powder and 480 grs. bullet. These two weapons are instanced, because they occupy a prominent position in the sporting annals of South Africa, where they have been indiscriminately used at all kinds of game, from the smallest buck to the elephant. Perhaps as a purely sporting weapon, the Westley Richards No. 2 Musket Rifle has had the greater popularity of the two rifles. Even to this day, while few hunters would have the temerity to employ either of them at the bigger game, both weapons continue in large demand for use at buck and kindred game.

In another section, I shall describe the various kinds of weapons, both single and double, and the cartridges they shoot, in use to-day throughout our South African Colonies.

Although treating of modern arms, there are two early rifles deserving of mention from the fact that they possessed exceptional merits, and attained to great celebrity as being successful for both sporting and target purposes. The first was the Westley Richards Breech and Muzzle-loading Capping Carbine, invented in the year 1858. This weapon instituted a new system both as regards its barrel and its breech action.

The second arm referred to was the Metford rifle introduced about 1876. This system solely concerned the method of boring and rifling of the barrel, the construction of bullet and cartridge load; and the improvements effected in those directions were applicable to a variety of breech actions.

The Westley Richards Capping Carbine, earlier than the Snider or Martini, achieved many distinctions. It was the first breech-loader adopted by the British Government.

At the National Rifle Association's Annual Meeting, then held at Wimbledon, it won the Duke of Cambridge prize eight years in succession. Hundreds of thousands were supplied to the Boers, who acquired with these weapons their unique proficiency in marksmanship. As Montague says, in his *Tales of a Nomad*—"They made the Boers perfect shots and judges of distance."

Metford, the celebrated engineer, to whose scientific achievements credit has never been fully accorded in print, will always occupy a foremost place amongst those who have bestowed close attention upon rifle problems. In knowledge of the barrel, its rifling, and of ballistics generally, he has no superior even at the present day. He devoted his life to the development and perfecting of rifle shooting. His Metford rifling, whose undeniable merits were fully recognized by the practical gunmakers and experts of the day, was adopted by the Government of this country fourteen years or more after he had established it as a success. Many years prior to this tardy recognition of its great merits, rifles bored on this system, constructed by Gibbs of Bristol and Westley Richards of London, who were Metford's exclusive licensees to make his system of rifling under royalty, had for years carried all before them at Wimbledon, making highest possible scoring results at long ranges even up to 1100 yards or more, with a standard of shooting previously thought to be unattainable. These highly successful results doubtless influenced the Military Authorities to adopt the Metford Rifling, as certainly they taught sportsmen in various parts of the world to prefer it to any other.

By the use of seven shallow grooves and a segmental cut of rifling, which almost stamped the system as being a semi-smooth bore, the Metford system of rifling had just that degree of influence upon the flight of the bullet, which extracted from its energy the maximum of steadiness. Coupled with this was a specially prepared and hardened bullet constructed of proportional length to diameter, all properly controlled by a due relationship to the bore of the barrel and pitch of rifling, consistent with the powder charge or velocity, to impart the necessary rotation to the bullet. The hardening was produced by tin and antimony as follows—

Lead, 100; tin, 2; antimony, 2; or, lead, 100; no tin; $3\frac{1}{3}$ antimony, or 30 to 1.

After sizing, the bullet continued to increase in hardness for a period of two months.

The remarkable record achieved by this system as applied to match rifles as well as to sporting weapons, speaks volumes for the amount of skill and science which were then applied to develop the cartridge loaded with black powder and lead alloy bullets.

Although, in the ·303 Service rifle, the Metford rifling has been superseded by the Enfield form of groove, there are still those who consider that the shooting quality of the Metford system, as

Metford designed it, is superior to the Enfield. The lightly-formed Metford rifling was abandoned, for military purposes, on account of the enormous wear its light groove was subject to, and the flatter or squarer Enfield, which is claimed to give a longer life to the barrel, adopted in its place.

But in point of accuracy, the Metford system stands supreme. To this day there are hundreds of sporting rifles in all bores from ·303 to ·577 in use with rifling cut on the pure Metford system, and I imagine that the best constructor of sporting rifles will be slow to discard the Metford system of rifling. This rifling was first introduced in connection with the ·450-bore.

DETAILS OF METFORD RIFLING.

(Hardened Bullet—Shallow Rifling.)

Number of grooves, 7.
Depth of grooves, ·003.
Pitch, as below.

Metford claimed to have invented a system of rifling with the pitch accelerating towards the muzzle to take up the spin of the bullet at the point it was believed to be losing its velocity, dependent upon the evolving of the gases.

The Metford pitch that I have had an opportunity of measuring started at the rate of about one turn in 50, and ended in about one turn in 16, in a 33-inch barrel, the precise measurements being as follows—

In the first 11½ inches from breech, there is ¼ turn at the rate of 46 inches (*i. e.* one turn in 46 inches).

In the next 7 inches (up to 18½ inches) ¼ turn in 28-inch pitch.
" " 5½ " " 24 " " " 28 " "
" " 4 " " 28 " " " 15½ to 16-inch pitch.

i. e. one turn in 28-inch sporting barrel.

15½-inch pitch for last 5 inches—*i. e.* practically the same as a 33-inch barrel, ending in one turn in 15½ inches, or practically 34 calibres of ·458-bore.

It is I think established that the accuracy of the Metford nominal ·450 rifle was due in no small degree to the accelerated pitch, and was the most practical way of extracting the highest possible accuracy from a lead bullet. A uniform quick pitch owing to fouling not being practicable.

In modern rifles, shooting nickel-covered bullets, the Metford principle of shallow grooves and segmental cut, are still adopted, but, owing to the nickel bullet and smokeless powder, a quick pitch is permitted to be employed throughout the barrel, thus practically abolishing leading and fouling.

Sporting testimony as to the efficiency of the ·450-bore Metford rifle is not lacking, and among others, we read of Mr. F. C. Selous, of South African celebrity, saying—"You can kill anything that walks on the earth with a ·450 rifle by Gibbs."

It is an undoubted fact that the Metford rifle has succeeded on many occasions in bagging big thick-skinned animals of the largest type, such as elephant and rhinoceros, with a single bullet, and that the original Metford system doubtless may be regarded as having reached the acme of efficiency and accuracy under black powder conditions.

The system was further extended by Westley Richards, who, ten or twelve years ago, built ·500-bore double and single rifles on a similar system to the ·450-bore, known as the long-range game rifle, which was successfully used by many big game-hunters in preference to the short-range "Express."

On this rifle, Mr. Teasdale Buckell, in his *Experts on Guns and Shooting*, writes as follows—

"This long-range Westley Richards sporting rifle is new to us. It has very much the character of the old match rifle, and it will be seen that its projectiles retain much greater energy at 300 yards than do those from the 'Express' of similar calibre with their 440-grs. bullets.

"Although the drop of the bullet is obviously much more than that of the 'Express,' the energy is higher at every point after 100 yards, and of course beyond 300 yards, if such distances in sport are wanted, the retained energy of the heavy bullet is proportionately increased.

"We do not know that any other maker takes so much trouble to turn out a rifle, and suitable ammunition for it, that will do so many things."

The Metford system of rifling and bullet undeniably would have had a much greater vogue had it not been that at the time when all its merits had been made plain, smokeless powder and nickel-covered or compound bullets received the approval of Military Authorities, whose weapons—as we know to a large extent, but without justification—set the fashion to sportsmen.

The metal-covered bullet was used in military arms twenty years ago, a copper-coated bullet being then employed in conjunction with black powder. I think the Guedes rifle adopted by Portugal in 1885, is the first of this type. It shot 71 grs. of powder with a hard lead bullet, copper envelope, point bare, calibre ·315.

Black Powder Rifles.

Although not in great demand, rifles of the following bores shooting black powder are, nevertheless, employed by sportsmen in India, Persia, and parts of Africa. Also in Java and Borneo for slaying the larger mammals and dangerous game.

12-Bore.

Weight, 12 lb. to 13½ lb.
Length of barrel, 28 inches.
Charge of powder, 5½ dr. to 7 dr.
Sights, fixed standard to 50 yards and leaves beyond.
Range, 250 yards.
Bullet, 585 grs. spherical, or short bluff-headed conical bullet.

10-Bore.

Weight, 13¼ to 14½ lb.
Length of barrel, 28 inches.
Charge of powder, 9 to 10 dr.
Sights, fixed standard to 100 yards and leaves beyond.
Range, 200 yards.
Bullet, spherical, 700 grs.; or short conical bluff-headed bullets, 1000 grs.

8-BORE.

Weight, $15\frac{1}{2}$ to 16 lb.
Length of barrel, 24 inches.
Charge of powder, 10 to 12 dr.
Sights, standard to 50 yards and leaves beyond.
Range, 200 yards.
Bullets, conical, 1257 grs.; spherical, 884 grs.

4-BORE.

Weight, 19 to 21 lb.
Length of barrel, 24 inches.
Charge of powder, 12 to 14 dr.
$\left.\begin{array}{l}\text{Sights}\\ \text{Range}\end{array}\right\}$ 100 yards to 150 yards.
Bullet, conical, 1882 grs.; spherical, 1250 grs.

These represent the best and most approved types, but modified patterns, mostly of lighter weights and shooting lighter charges, were also used.

The records of rifles of the bores above given are stamped with such success that they will always occupy a prominent place in sporting history, and as their position is probably unique, it is only well that their past service should receive recognition. It may be said that but for present innovations and improved small bores adapted to the same purpose in use to-day the reputation of these rifles would die hard. Big game we know has been successfully bagged by the small ·450, and even the ·303, but the most celebrated game hunter perhaps of the last century deliberately employed a weapon weighing more than double the modern type, and after all it is the achievement of these bygone weapons that we mostly talk about.

The best types of heavy wide-bore weapons follow the lines of the rifles adopted by Sir Samuel Baker, one of whose favourite weapons for elephant hunting was a four-bore by Gibbs. This weighed 21 lb., its barrel was three feet long, and its load consisted of 16 dr. of black powder and a 4-oz. bullet.

Baker remarked of it that—"An extraordinary success attended this rifle, which became my colossal companion for many years in wild spots for dangerous game." It will be observed that the powder charge was one-fourth the weight of the projectile, and not only a tremendous crushing power, but an extraordinary penetration was assured.

It has been continually stated that Baker was the most mighty elephant hunter who ever handled firearms. Most of his success has been attributed—and no doubt correctly—to his great physical endurance and strength, whereby he was able to carry and discharge the heaviest rifles and loads. He bore unflinchingly a recoil that would utterly have demoralized most shooters. Another favourite weapon of his was a double 8-bore weighing 16 lb., carrying 12 dr. of powder and 2-oz. ball.

The doughty doings of this Samson among hunters have been amply recorded; suffice it, therefore, to say that in five days' hunting in Ceylon Baker killed thirty-one elephants—truly a Gargantuan bag—fourteen of these large beasts falling to his rifle in one day. Once, if not indeed oftener, two elephants dropped dead as the result of a clean right and left with his double rifle.

Baker's big 4-bore once stopped a buffalo bull at a distance of nearly 800 yards, sending its 4-oz. ball completely through the animal, and crushing in its passage both hip-joints.

Since the introduction of the ball and shot gun, rifled only at the nose on the Fosbery principle, popularized by Messrs. Holland and Holland, or an alternative system of a shallow rifling throughout the bore, and other similar modifications, such as the Colindian, these formidable weapons in 16, 12, 10, and 8 bores can be constructed of much lighter weight in proportion to their power, and moreover without undue recoil.

In speaking of these large bore black powder rifles, the considerations of trajectory and ranging power spoken of previously were comparatively of little importance by reason of the fact that the bigger game was invariably killed at close distances.

Nevertheless it is on record that eminent gunmakers have been requested by innocent missionaries in the early days of South African development, to construct rifles effective to distances more than necessary to exclude possible danger.

A former bishop once wrote to an eminent gunmaker for a

4-bore rifle to kill elephants at 1000 yards, and the ingenuity of even the British gunmaker was confessedly unequal to the task. Brave in combating supernatural enemies, the good bishop undoubtedly found his sporting courage at the best when distance lent diminutiveness to the animal; or the more it approached the unseen.

For instance, although Sir Samuel Baker did make an extraordinary shot, killing a buffalo at 800 yards, this was a truly phenomenal incident, and the bulk of his shooting was doubtless conducted at distances seldom exceeding 100 yards. In all probability most of the animals he killed were bagged at even shorter ranges.

I also append below specifications of the double express rifles to complete the black powder series. These double express weapons are fast becoming obsolete in view of the introduction of the smokeless powder rifles, but there are certain bores which are still preferred by sportsmen in the East. Smokeless powders have been adapted more or less successfully to these rifles and cartridges.

DOUBLE RIFLES FOR BLACK POWDER.

1.—·360-Bore Express.

Weight, about $6\frac{3}{4}$ lb.

Barrel, 28 inches to 30 inches.

Charge powder, 55 grs.

Bullet, 190 grs.

Muzzle velocity, 1700 feet per second; 100 yards' velocity, 1381 feet per second.

Muzzle energy, 1218 feet per second; 100 yards' energy, 803 foot-lb.

Cartridge case, straight taper, $2\frac{7}{16}$ inches.

2.—·400-Bore Express.

Weight, $7\frac{1}{4}$ to $7\frac{1}{2}$ lb.

Barrel, 27 inches to 28 inches.

Charge powder, 80 grs.

Bullet, 230 grs.

Muzzle velocity, 1850 feet per second; 100 yards' velocity, 1500 feet per second.

Muzzle energy, 1747 foot-lb.; 100 yards' energy, 1152 foot-lb.

Cartridge case, bottle neck, $2\frac{3}{8}$ inches.

3.—·400-Bore Express.—Magnum.

Weight, 8 to $8\frac{1}{4}$ lb.

Barrel, 28 inches.

Charge powder, 110 grs.

Bullet, 230 grs.

Muzzle velocity, 2000 feet per second; 100 yards' velocity, 1630 feet per second.

Muzzle energy, 2041 foot-lb.; 100 yards' energy, 1336 foot-lb.

Cartridge case, bottle-neck, $3\frac{1}{4}$ inches.

4.—·450-Bore Express.

Weight, $8\frac{1}{2}$ to $8\frac{3}{4}$ lb.

Barrel, 28 inches for W. R. No. 1 Express cartridge.

Charge powder, 110 grs.

Bullet, 300 grs.

Muzzle velocity, 1859 feet per second; 100 yards' velocity, 1495 feet per second.

Muzzle energy, 2299 foot-lb.; 100 yards' energy, 1420 foot-lb.

Cartridge case, bottle-neck, $2\frac{3}{4}$ inches.

5.—·450-Bore Express.

Weight, $8\frac{1}{2}$ to $8\frac{3}{4}$ lb.

Barrel, 27 inches.

Charge powder, 110 grs.

Bullet, 270 grs.

Muzzle velocity, 1900 feet per second; 100 yards' velocity, 1521 feet per second.

Muzzle energy, 2162 foot-lb.; 100 yards' energy, 1386 foot-lb.

Cartridge case, bottle neck, $2\frac{3}{4}$ inches.

6.—·450-Bore Express.—Magnum.

Weight, 8$\frac{3}{4}$ to 9 lb.
Barrel, 28 inches.
Charge powder, 140 grs.
Bullet, 325 grs.
Muzzle velocity, 1950 feet per second ; 100 yards' velocity, 1625 feet per second.
Muzzle energy, 2741 foot-lb. ; 100 yards' energy, 1907 foot-lb.
Cartridge case, ·500/·450 magnum.

7.—·450-Bore Long Range Game Rifle.

Weight, 8$\frac{3}{4}$ to 9 lb.
Barrel, 28 inches.
Charge powder, 125 grs.
Bullet, 480 grs.
For use to 300 yards. Also 110 grs. and Express bullet 300 grs. to 200 yards.
Cartridge case, bottle-neck, 2$\frac{3}{4}$ inches.

8.—W. R. ·500-Bore Double Express.

Weight, 8$\frac{3}{4}$ to 9$\frac{1}{4}$ lb.
Barrel, 28 inches for W. R. No. 2 Express cartridge.
Charge powder, 125 grs.
Bullet, 360 grs.
Muzzle velocity, 1650 feet per second.
Muzzle energy, 2612 foot-lb.
Cartridge case, bottle-neck, 2$\frac{13}{16}$ inches.

9.—·500-Bore Express.

Weight, 8$\frac{3}{4}$ to 9$\frac{1}{2}$ lb.
Barrel, 28 inches, taper cartridge.
Powder, 136 grs.
Bullet, 340 grs.
Muzzle velocity, 1925 feet per second ; 100 yards' velocity, 1549 feet per second.
Muzzle energy, 2794 foot-lb. ; 100 yards' energy, 1809 foot-lb.
Cartridge case, straight taper, 3 inches.

10.—·500-Bore Express.—Magnum.

Weight, $9\frac{3}{4}$ to $10\frac{1}{4}$ lb.
Barrel, 28 inches.
Charge powder, 164 grs.
Bullet, 440 grs.
Muzzle velocity, 1880 feet per second; 100 yards' velocity, 1590 feet per second.
Muzzle energy, 3451 foot-lb.; 100 yards' energy, 2468 foot-lb.
Cartridge case, bottle-neck, $3\frac{1}{8}$ inches.

11.—W. R. ·500-Bore Long Range Sporting Rifle.

Weight, 9 lb.
Barrel, 28 inches.
Powder, 120 grs.
Bullet, 570 grs., shooting to 500 yards; also 500 grs. bullet for shorter ranges.
Muzzle velocity, 1542 feet per second.
Muzzle energy, 3005 foot-lb.
Cartridge case, taper, 3 inches.

12.—W. R. ·577-Bore Double Express.

Weight, 11 lb.
Barrel, 28 inches.
Charge powder, 160 grs.
Bullet, 520 grs.
Muzzle velocity, 1775 feet per second.
Muzzle energy, 3634 foot-lb.
Cartridge case, taper, $2\frac{3}{4}$ inches.

13.—W. R. ·577-Bore Double 3-inch Case.

Weight, $11\frac{1}{2}$ to 12 lb.
Barrel, 27 inches.
Powder charge, 167 grs.
Bullet, 570 grs. Also 610 grs. solid.
Muzzle velocity, 1725 feet per second.
Muzzle energy, 3761 foot-lb.
Cartridge case, taper, 3 inches.

Single-loader Rifles for Black Powder, mainly used for South African Sport, may be said to comprise the following :—

Martini sporting rifles and sliding-block under-lever rifles, of which there are three or four types, present no real differentiation.

Martini-Henry Sporting Rifle, ·450-Bore.

Cartridge, Martini, 85 grs. of powder.
Bullet, 480 grs.
Weight, from $7\frac{1}{4}$ to $7\frac{3}{4}$ lb.
Velocity, 1315 feet per second.
Energy, 1841 foot-lb.

Martini Sporting Rifle, ·450-Bore.

Cartridge, Westley Richards No. 2 musket, 76 grs. black powder.
Bullet, 480 grs.
Weight from 7 lb.
Velocity, 1238 feet per second.
Energy, 1632 foot-lb.

Westley Richards Sliding-block Under-lever Rifle—or Similar Type, ·450-Bore.

Cartridge, Martini, 85 grs. black powder.
Bullet, 480 grs.
Weight, $7\frac{1}{4}$ to $7\frac{3}{4}$ lb.
The foregoing rifles are *frequently* constructed to the above specification, but with Metford rifling.

Westley Richards Sliding-block Under-lever Rifle—or Similar Type, ·450-Bore.

Cartridge, Westley Richards No. 2 musket, 76 grs. black powder.
Bullet, 480 grs.
Weight, from 6 lb. 12 oz.

Westley Richards Sliding-block Under-lever Rifle, ·450-Bore.

Cartridge, No. 2 musket, Metford loading.
Powder, 80 grs.
Bullet, 570 grs.
Velocity, 1300 feet per second.
Energy, 2136 foot-lb.
Weight of rifle, $7\frac{1}{4}$ lb.

The foregoing are average weights, with 28-inch barrels, but of course extra length of barrels, form of barrels, addition of ribs top or bottom, or both, and other items of general make-up obviously would increase these weights proportionately.

This in natural sequence brings us to the consideration of rifles of small bore, which by means of smokeless powder and compound bullet mentioned, give a much higher velocity coupled with a greater degree of accuracy, an adaptation which has now been applied to the bigger calibres of rifles for sporting purposes.

The best known types of these small bores which have proved successful, are the Lee-Metford, and Enfield ·303; the Mauser ·275- and ·311-bores, and the Mannlicher ·256.

Practically the whole of the civilized world has adopted the small-bore rifle as its military arm, none being larger than ·315, with a bullet from 230 grs. to 244 grs. as in the case of France and Austria, nor smaller than ·256-bore with a bullet of 162 grs., as in the case of Japan.

Single-loader Rifles—Under-lever Sliding-block Action.

·256-bore. 28-inch barrel.
Charge powder, 31 grs. cordite.
Charge bullet, 160 grs.
Weight of rifle, 7 lb. 4 oz.
Sights, fixed standard and folding leaves.
Muzzle velocity, 2395 feet per second; 100 yards' velocity, 2182 feet per second.
Muzzle energy, 2094 foot-lb.; 100 yards' energy, 1702 foot-lb.

MANNLICHER MAGAZINE RIFLE—5 CARTRIDGES IN MAGAZINE.

·256-bore. 28-inch barrel.
Charge powder, 31 grs. cordite.
Bullet, 160 grs.
Weight of rifle, 7 lb. 12 oz.
Sights, as above.
Muzzle velocity, 2395 feet per second; 100 yards' velocity, 2182 feet per second.
Muzzle energy, 2094 foot-lb.; 100 yards' energy, 1702 foot-lb.

MANNLICHER SCHONNAUER MAGAZINE ACTION—5 CARTRIDGES IN MAGAZINE.

·256-bore. 28-inch barrel.
Charge powder, 31 grs. cordite.
Bullet, 160 grs.
Weight of rifle, 7 lb. 8 oz., etc., as above.

MAGAZINE MAUSER RIFLE—5 CARTRIDGES IN MAGAZINE.

·275-bore. 28-inch barrel.
Charge of powder, 38 grs. nitro-cellulose or equivalent in cordite.
Bullet, 172 grs.
Weight of rifle, 6 lb. 12 oz.
Sights, fixed standard and folding leaves.
Muzzle velocity, 2296 feet per second.
Muzzle energy, 2011 foot-lb.

MAGAZINE, LEE-METFORD AND ENFIELD RIFLE—10 CARTRIDGES IN MAGAZINE.

·303-bore. 28-inch barrel.
Powder, 31 grs. cordite.
Bullet, 215 grs.
Weight of rifle, 7 lb. 9 oz.
Sights, fixed standard and folding leaves.
Muzzle velocity, 2000 feet per second; 100 yards' velocity, 1831 feet per second.
Muzzle energy, 1920 foot-lb.; 100 yards' energy, 1609 foot-lb.

Single-loader Rifles.

·303-bore. 28-inch barrel.
Cartridge, as above.
Weight of rifle, 7 lb. 2 oz.
Sights.
Muzzle velocity. } Same as above.
Muzzle energy.

Magazine Mauser Rifles—5 Cartridges in Magazine.

·311-bore. 28-inch barrel.
Powder, 41 grs. special, or equivalent in cordite.
Bullet, 227 grs.
Weight of rifle, 7 lb. 5 oz.
Sights, fixed standard and folding leaves.
Muzzle velocity, 2093 feet per second.
Muzzle energy, 2090 foot-lb.

Magazine Rifle with Lee Action—4 Cartridges in Magazine.

·375-bore. 28-inch barrel.
Bullet, 270 grs. solid and patent capped expanding bullet.
Powder, 40 grs. cordite.
Weight of rifle, 7 lb. 9 oz.
Sights, as above.
Muzzle velocity, 2000 feet per second, 100 yards' velocity; 1778 feet per second.
Muzzle energy, 2396 foot-lb.; 100 yards energy, 1893 foot-lb.

Magazine Rifle Mannlicher Action (as above).

·375-bore. 28-inch barrel.
Weight of rifle, 6 lb. $13\frac{1}{2}$ oz.

Single-loader Rifle.

·360-bore. 28-inch barrel.
Powder, 41 grs. cordite.
Bullet, 314 grs.

Weight of rifle, $6\frac{3}{4}$ lb. to $7\frac{1}{4}$ lb.

Sights, as above.

Muzzle velocity, 1875 feet per second; 100 yards, 1707 feet per second.

Muzzle energy, 2450 foot-lb. per second; 100 yards, 2030 foot-lb.

Single-loader rifle, ·375-bore, same weight.

In addition to the above, Messrs. Rigby have recently introduced a ·350-bore Mauser action magazine rifle of which report speaks well.

There are other ·360-bore cartridges of practically the same ballistics, with modifications in form of cartridge, bullet, etc., to suit the maker's particular fancy.

Single-loader Rifle—Shooting Cartridges of Semi-H.-V. Type.

·360-bore. 28-inch barrel.

Powder, 30 grs. cordite.

Bullet, 300 grs.

Weight of rifle, $6\frac{3}{4}$ lb.

Sights, as above.

Muzzle velocity, 1650 feet per second; 100 yards, 1484 feet per second.

Muzzle energy, 1812 foot-lb.; 100 yards, 1466 foot-lb.

In addition to the folding sights, tangent sights are frequently adopted. For high-velocity rifles up to 300 yards, however, there is no practical need for more than one fixed sight, the amount of bead taken through the "V" giving the correct elevation for each range. This matter is dealt with in the chapter referring to Trajectory.

American magazine rifles of well-known types, hitherto, have been confined to special cartridges little known to the average British big game shooter, but of late years firms manufacturing the Winchester, the Marlin and the Savage rifles, have adapted their arms for certain forms of what they term "High Pressure

Cartridges," which are more or less reproductions of the British high velocity series, having approximately the same ballistics.

The above list practically exhausts the rifles available or necessary for animals included in the category of deer, although they are often used for bigger game—the ·360 and ·375 having proved effective at tiger. The following series show larger bores of single rifles and double rifles mentioned later, being especially suitable for the bigger antelopes and dangerous large game.

As sporting barrels may be somewhat shorter than 28 inches, and vary considerably, the velocities and energies will be proportionately modified. For instance, a ·256 Mannlicher rifle with a barrel $25\frac{1}{8}$ inches long instead of 28 inches (the usual sporting length) under the same conditions gives a reduced velocity of 2276 feet per second, as against the standard muzzle velocity of 2395 feet per second given with a 28-inch barrel. And, of course, slight variations will be shown in each similar case.

The Mannlicher rifle with barrel of military length, *i. e.* 31·1 inches, gives a muzzle velocity of 2433 feet per second.

Besides the solid bullet, all these weapons shoot sporting bullets of more or less excellent design and general effectiveness. Amongst these are the soft-nosed, copper-tubed, split bullet, and the latest design of sporting bullet—the capped expanding bullet.

Westley Richards High-Velocity Nitro-Express Rifle, ·400-Bore.

Muzzle velocity, 2150 feet per second; muzzle energy, 4100 foot-lb.

100 yards' velocity, 1953 feet per second; 100 yards' energy, 3385 foot-lb.

Cordite powder, 60 grs. Bullet, 400 grs.

Also with 300 grs. bullet and lighter charge. With heavy charge it is equal in smashing power to the old ·577 Express rifle.

Westley Richards High-Velocity Nitro-Express Rifle, ·450-Bore.

Muzzle velocity, 2150 feet per second; muzzle energy, 4922 foot-lb.

100 yards' velocity, 1944 feet per second; 100 yards' energy, 4024 foot-lb.

Cordite powder, 70 grs. Bullet, 480 grs.

Weight of single rifle from $8\frac{1}{4}$ to 9 lb.

Westley Richards High-Velocity Nitro-Express Rifle, ·500-Bore.

Muzzle velocity, 2100 feet per second; muzzle energy, 5577 foot-lb.

100 yards' velocity, 1893 feet per second; 100 yards' energy, 4532 foot-lb.

Cordite powder, 80 grs. Bullet, 570 grs.

Weight of single rifle, from $8\frac{1}{2}$ to $9\frac{1}{2}$ lb.

Westley Richards High-Velocity Nitro-Express Rifle, ·577-Bore.

Muzzle velocity, 1950 feet per second; muzzle energy, 5483 foot-lb.

100 yards' velocity, 1730 feet per second; 100 yards' energy, 4310 foot-lbs.

Cordite powder, 90 grs. Bullet, 650 grs.

This powerful weapon is also constructed to shoot a lighter charge of cordite, and a special soft lead bullet, which expands freely on impact, and inflicts a most deadly wound.

Weight of bullet, 560 grs.

Muzzle velocity, about 1950 feet per second.

Muzzle energy, about 4700 foot-lb.

Weight of single rifle, from 10 to 11 lb.

Westley Richards High-Velocity Nitro-Express Rifle (Magnum), ·577-Bore.

Muzzle velocity, 2050 feet per second; muzzle energy, 6990 foot-lb.

100 yards' velocity, 1818 feet per second; 100 yards' energy, 5680 foot-lb.

Cordite powder, 100 grs. Bullet, 750 grs.

Weight of single rifle, 11 to $11\frac{1}{2}$ lb.

Westley Richards High-Velocity Nitro-Express Rifle, ·600-Bore.

Muzzle velocity, 1850 feet per second; muzzle energy, 6831 foot-lb.

100 yards' velocity, 1635 feet per second; 100 yards' energy, 5337 foot-lb.

Cordite powder, 100 grs. Bullet, 900 grs.

Weight of single rifle, 12 to $13\frac{1}{2}$ lb.

For weights of double rifles of the above class, *vide* Chapter VIII.

The subject of sporting bullets is fully dealt with under its own special chapter.

Having now detailed the varieties of sporting rifles to-day in use, it may be well to inquire whether all conditions of sport are adequately met by such weapons, and whether or not further modifications of present types, or altogether new types of rifles would be likely to further the sportsman's needs.

Two complaints are sometimes levelled against modern rifle makers.

1. That they too frequently regard the construction of sporting rifles from the standpoint of military rifles.

2. That they have paid too much attention to the quality of penetration, and not sufficient to the expansion of the bullet.

When the ·303 British Service Magazine Rifle was first employed at game, it was asserted that this high power small bore, owing to its superior velocity, was suitable for use against the bigger kinds of game, and from time to time accounts were published of satisfactory performances with this weapon at elephants, rhino, hippopotamus, and a variety of deer. These records, although remarkable, must be considered exceptional, arising probably, that by a lucky chance vital spots were struck. Even though the accuracy was of an improved order and the trajectory flatter, the element of luck was not absent in placing shots just where the hit would be fatal, considering that a deviation from that spot of a fraction of an inch might result only in a wound which would permit the animal to escape.

What has been proved after many years' experience of these high-velocity small-bore rifles is, that on the whole their bullets are lacking in the necessary degree of expansion and shock-giving qualities.

A writer in the *Indian Field* of March 8, 1906, says: "I have fired a large number of rounds from a Mauser, and my experience is as follows. The accuracy of the rifle is phenomenal, and for antelope, gazelle, and other small fry it is a splendid weapon. For ibex, birrel, schapoo, etc., it is not so good. Of course, providing the bullet is correctly placed, any mountain game will drop to it. It is, however, given to very few, if any of us, to make a certainty of thus hitting an animal every time; and, in addition, wind has sometimes a good deal to do with lateral deflection on the mountain side. I have found that an animal hit full in the middle of the body, but a hair's-breadth or less too far back from the shoulder, not infrequently goes off as if nothing had happened. I have known a case of an ibex, hit a few inches too far back, going off and climbing up a cliff like the side of a house, and although he was recovered afterwards, until we saw the blood on his side, one could have sworn that the shot was a clean miss. I think all will agree that this sort of thing is not good enough. It is the wish of sportsmen to kill or miss, *and these small bores do not by any means do this*, and we want something heavier for the work."

Some forms of bullet are much more effective than others. I am convinced that under the foregoing conditions the proved capacity of the Westley Richards copper-capped bullet to insure a larger wound-channel and impart greater shock than any other form of bullet, would considerably lessen, if not entirely remove, the reasonable objections referred to as attaching to the small-bore rifle.

A tide of opposition set in against this fashion in ·303-bore and similar bores some few years ago, which brought about the introduction of smokeless powder rifles of much larger calibre and higher power, but, unfortunately, carried the change to an opposite extreme; many of such rifles having too much power, coupled with the extreme penetration first associated with the small-bore military rifles. This, in truth, may be said of all the bores which this new series added to the catalogue of modern sporting rifles, excepting perhaps the ·577- and ·600-bores, which are especially intended for shooting the larger mammals against which projectiles with the highest order of penetration are frequently essential.

Military and sporting rifles have different and distinct uses. One or the other may be used for either purpose, but rightly considered they occupy a different category.

The sportsman goes out to kill, and feels that he has a grievance if he only succeeds in wounding his game. While killing is part of the business of war, we read that wounding your enemy is frequently the better strategy.

With this view in mind, modern military rifles have been constructed. It would have been better for sportsmen if the manufacturer of sporting weapons also had always kept before him the objects and the conditions of usage of the sporting rifle, and as faithfully carried them into practical effect as the military rifle constructor has done with his particular arm.

The series of high power rifles from ·360- to ·600-bore for the most part are excellent sporting weapons and have very fine performances to their credit. But they err on the side of excessive penetration, and especially is this so when used against lightly-built and thin-skinned animals.

Placing these rifles in their various categories, the high power weapons of large calibre, with very high penetration, may be confined to the larger mammals; the ·450- and ·400-bores, with solid-nickel and expanding bullets, to the bigger antelope and for use perhaps even at rhino.

Still there remains a class of shooting which demands a rifle that shall stand midway between the old express black powder rifles and the modern high-velocity cordite rifles. The smallest of these, ·360, would be capable of accounting for the largest stag, and the ·400- and ·450-bores being especially adapted for shooting the larger deer and other animals of a non-dangerous character; while the ·500- and ·577-bores would be reliable for use against tiger, lion and animals of a dangerous type.

For such sport the ideal expanding bullet is one made of lead in one form or other. For smokeless powder a modified form of lead bullet constructed with a nickel base has been found necessary.

This form of bullet has, however, brought in its train an increase of velocity as compared with the black powder express cartridges of the same bore and type, with a correspondingly greater penetrative force, which has, therefore, diminished the expansion of the old express bullet already found too little against certain animals.

Hence the request for a smokeless powder rifle shooting a cartridge which will revert to the old express system of expansion and, if possible, even will increase that degree of expansion. The interest created by the attention given to sporting projectiles and their developments throughout the past six years has resulted in many changes in bullet construction ; the very necessity of making the solid nickel bullet expansive has brought about improvements capable of application to lead bullets of the past.

In this case at least we have a verification of the proverb, "Necessity is the mother of invention."

One of the improvements consists in making a nickel base lead bullet with a metal cap or tip. By this means the degree of expansion is considerably increased.

Weapons built for smokeless powder and shooting such bullets, having a degree of expansion superior to any other kind hitherto known, will be appreciated by sportsmen engaging in that class of sport where the desideratum is expansion pure and simple as opposed either to penetration alone or to penetration and expansion combined, which other kinds of shooting may render necessary.

Particulars of these rifles are given at the end of Chapter XII, under the title of "Nitro-Expansive Express Rifles."

CHAPTER VIII

MODERN SPORTING RIFLES—*continued*

Single-loading, Magazine, and Double Rifles.

PRACTICALLY, in the past only two kinds of sporting weapons entered into the consideration either of the sportsman or of the rifle-maker, viz. the single barrel containing one cartridge, and the double barrel weapon containing two cartridges.

The improvements effected in magazine weapons, leading to their adoption by the Governments of the world, subsequently introduced to the sportsman the magazine system of loading, thereby adding a third weapon to his choice.

There are many different views as to the best type of sporting weapon, and after all the choice of system must be left to the sportsman himself, whose decision will be dictated by the conditions of sport on the one hand, and the spirit with which he enters into that sport, on the other.

It is a significant fact that for the last half-century sportsmen of renown, and a large number of other proficient but less-known shooters, have successfully hunted game in Africa with single loading rifles; and during the same period a considerable number of sportsmen in India and elsewhere have also employed the same system of weapon. There must have been something in the economic conditions of Africa which led to such an universal and unalterable attachment to the single loader, because as compared with the double rifles the price is frequently less than half; moreover, the prevalence of game of all kinds, which formerly existed in vast quantities, and therefore proved readily accessible, perhaps did not call for a more effective or quicker firing weapon than the single loader.

Doubtless other influences were at work ; but whatever the cause, I am only interested in the fact that fifty years' use of the single-loading rifle has proved that it was capable of satisfying the most ardent sportsman.

No doubt those who have become accustomed to a single loader frequently find difficulty in changing to a double ; or it may be that men are satisfied with their single loaders, and on meeting with others who use doubles, begin to search about for reasons why the single loader is so satisfactory. I have heard African sportsmen say that they could do all with a single loader that a man could do with a double, and do it better ; the reason given being that under the circumstances of an inaccurate aim through imperfect alignment of the rifle, the sportsman cannot adjust his aim unless he moves the gun from his shoulder deliberately, and takes an entirely fresh aim. Where a man attempts to readjust his aim with the rifle at his shoulder, a failure usually results.

However, during the time it takes a man to remove his single rifle from his shoulder, he has also the time to open the breech and insert another cartridge. Therefore it was argued that with a double rifle, should the first barrel be badly aimed the second would certainly be so, unless there was a subsequent readjustment of the gun to the shoulder.

Except by the Boer hunters, who generally were most conservatively attached to their weapons, many people satisfied with the single loader have been induced to take the magazine in preference, probably owing to game being driven further afield, with the result that as good hunting grounds are removed to greater distances visits become scarcer, and sportsmen doubly anxious to make the most of time and opportunities.

Probably many men who now take single or magazine loaders would be satisfied with a double rifle but for the high price of the latter. The price of magazine rifles is temptingly low, and thus the very cheapness may lead true sportsmen to be unsportsmanlike, and so create a class of shooters who indulge in an excessive slaughter of game.

Rightly considered, like the pump gun of America, the magazine rifle is not a desirable weapon for general sport.

But apart from this there are practical objections to the magazine system.

The keen and cautious sportsman goes about his work with studied silence ; he detests noises of all kinds, and this essential and vital quality of the sporting habit and instinct is absolutely impossible with the rattle and jar of the magazine rifle.

The single-loader rifle is practically noiseless when manipulated. However carefully you operate a magazine rifle of any kind you get that objectionable rattle which is fatal to successful sport ; the result is that the magazine rifle, by frightening game, is provocative of disappointment which is possibly responsible for a waste of ammunition and unnecessary cruelty through wounding of animals by snap shooting out of range. It is, in short, a demoralizing factor, and the use of such weapons will probably ultimately result in the production of a degenerate race of sportsmen, however much regulations to limit the bag may be formulated.

In a recently published work, *The Modern Sportsman's Book for India*, edited by F. G. Aflalo, Lieut.-Gen. Sir Montague Gilbert Gerard, in writing on the shooting of tiger, panther, and bear, remarks—

"If a sportsman employs a single barrel, he should use a sporting and not a military action (such as the Lee-Metford), as the clatter of the bolt when reloading is hopeless in a quiet corner."

Again, in this same book, Lieut.-Col. P. R. Bairnsfather, says—

"There is need for absolute silence. . . . Of all the deer, the sambur is the most timid and cunning in refusing to be driven ; at the last moment he will suddenly break back, charging right through the beaters, or over any man who bars his way, and so many drives are in vain. Adequate concealment and perfect silence and stillness are therefore necessary."

It is plain that under such circumstances, and indeed under all conditions where wild and wary game is being circumvented, the far-sounding clatter of a magazine rifle will frequently scare game and lead to loss of sport. It is singular that American sportsmen should have been so alive to the absolute need for silence in stalking game as to have originated that expressive term "still-hunting," and yet be guilty of using one of the noisiest weapons possible, to wit, the magazine repeating rifle.

In order to show the distinction between the two systems, I give a specification of the highest type of modern sporting single loader rifles, in comparison with a magazine sporting rifle of similar quality.

SPECIFICATION.

Modern Under-lever Single-loading Rifle.

Action, under-lever system.
Automatic top safety bolt as on high-class sporting double rifles.
Pull off, adjustable from 3 lb.
Barrel detachable with the same ease and readiness as is the barrel of an ordinary game gun.

Magazine Rifle, Same Bore.

Action, Mauser system.
Safety bolt, not automatic, clumsy to use.
Pull off, adjustable from $4\frac{1}{2}$ to 5 lb.
Weight of action, $2\frac{3}{4}$ to 3 lb.
Barrel generally fixed and incapable of detachment in this case.[1]

The short, compact and light action of the single loader enables the rifle-maker to produce perfectly-balanced single rifles in all bores.

Magazine Mauser Sporting.

Weight of action, 2 lb. $14\frac{1}{4}$ oz.
Number of parts, 30.

Magazine Mannlicher.

Weight of action, 3 lb.
Number of parts, 33.

Magazine Mannlicher Schonauer.

Weight of action, 2 lb. 15 oz.
Number of parts, 39.

[1] Recently Messrs. Westley Richards have applied their detachable barrel system with solid locking lugs to magazine rifles; and there are other systems in vogue.

MAGAZINE LEE-METFORD, ·303.

Weight of action, 2 lb. $12\frac{1}{2}$ oz.
Number of parts, 30.

W. R. UNDER LEVER. Weight of action, 2 lb. $5\frac{3}{4}$ oz. Number of parts, 32. FOREIGN UNDER LEVER. Weight, 2 lb. 15 oz. Number of parts, 35.	Single loaders, and will take any rim cartridge.

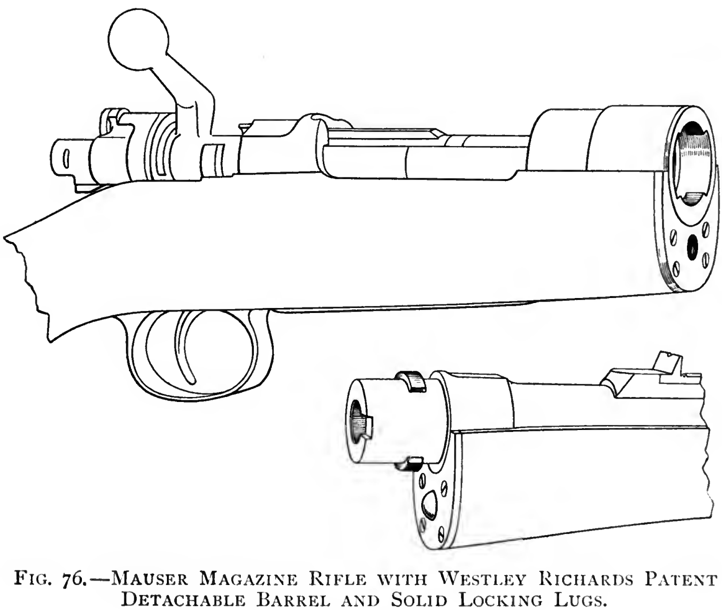


FIG. 76.—MAUSER MAGAZINE RIFLE WITH WESTLEY RICHARDS PATENT DETACHABLE BARREL AND SOLID LOCKING LUGS.

In comparison with the magazine rifles, it will be seen that the single rifle actions weigh so much lighter although they consist of practically the same number of parts, and thus by their very construction we are enabled to obtain a lighter weight in the middle of the weapon which ensures more perfect balance, a quality extremely desirable to an ideal sporting weapon. In this respect the argument is altogether in favour of the single loader merely as a matter of construction, but the argument becomes all the more valuable when we note that each time a cartridge is ejected from the breech of a magazine rifle the balance is thereby disturbed. In a five-loader, for instance, when four cartridges disappear this will be appreciated.

In comparison with the magazine loader, we find in the single loader that smoothness of action and that almost silent or noiseless motion which are such enormous aids to a sportsman. It is said that in time those even of the smallest experience amongst sportsmen come to learn the great value of stillness and silence in sport previously alluded to. These qualities, albeit of the utmost importance in stalking or in tracking game of a wary or sensitive kind, or in countries where the number has been considerably reduced, do not specially appeal to those sportsmen who may be invading virgin soil where game exists in such abundance that the difficulty is *not* to shoot it.

In some countries game is so plentiful and unsuspecting that it requires little or no skill on the part of the sportsman to get a good bag. Whether in such cases a sportsman uses a magazine, a single loader or a double loader, is not a matter of much importance to our present discussion, because from the very abundance of game to be killed, a sportsman naturally takes in hand that weapon which would enable him quickly to gather the biggest bag. No doubt this wholesale shooting will find its limitations in the restrictions which civilization and a wide regard for the future impose upon the killing of game, and that those restrictions will, at the same time to a certain extent, counteract the use of magazine rifles, which otherwise would become veritable game exterminators.

At the present time, in the new districts opened up in British East Africa, in portions of the Congo, in Uganda, and in the country beyond, the plethora of game and the magazine rifle both combine to bring about an abuse of true sport. When sport in these districts settles down to normal conditions there is little doubt that proper consideration will be given to the question of weapons, and that in the main the sportsman's choice will fall upon a single loader or a double-barrelled breech-loading weapon.

Too much importance cannot be attached to the question of safety. A system which provides safety, and at the same time saves the sportsman trouble and time in effecting it, is so much superior to a system which calls upon the sportsman personally to attend to the safety of the arm after cocking the weapon by means of a further manual operation. No magazine rifle is fitted with a safety equal to the automatic safety now supplied on single loaders.

The practised sportsman will appreciate the detachable barrel, *first*, on the ground of portability, which is a point to be considered when on an expedition, apart from the question of space, and also for the safe carrying of the arm. *Second*, by reason of being able more readily to ascertain the condition of his barrel, and keep it in good preservation. *Third*, from the fact that duplicate barrels or interchangeable barrels of different bores may be fitted to the same stock.

These are the points which I think any impartial judgment will decide as those upon which a single loader is superior to the magazine, but after all has been said, the magazine rifle still appeals to a certain class of shooter by its capability of rapid firing whether such may be necessary or not.

DOUBLE RIFLES.

A double-barrelled weapon may be regarded as the beau-ideal of a sporting rifle. It gives to the sportsman, by reason of the two cartridges with which it can be charged at one time, just that advantage which enables him to achieve success in a sportsmanlike manner. These two shots give sufficient reserve to enable the sportsman to retrieve the failure of an ill-aimed first shot, which becomes all the more important when its use at dangerous game is considered.

In this reserve of ammunition lies one of its chief claims as a sporting weapon. But beyond the question of reserve, which may equally apply to a single-barrel magazine rifle, there is the great recommendation that its build and general lines of construction approximate very closely to that of the ordinary breech-loading gun with which the average sportsman is so familiar.

Take a high-class modern game gun and compare it with a double rifle of similar type, and you will find the same top lever, ejector, and safety-bolt, requiring the same movement on the part of the sportsman to manipulate, and thus in the aggregate you have a weapon which, although heavier, offers practically the same balance and general handiness.

A sportsman accustomed to ordinary game shooting can take up the double-barrelled sporting rifle without having to learn anything afresh. This fact becomes all the more appreciable when, as it frequently happens, sportsmen abroad find that at times they have to employ alternatively the double-barrelled game gun and the rifle.

Over and above the latter consideration, there remains the fact that the handiness of the double rifle, built as it is on shot-gun lines, assists materially towards the killing of moving game. But, further than this, the two shots of a double-barrelled rifle, if desired, can be taken much more quickly than two shots with any other existing system of rifle. They may be fired so quickly as to be almost simultaneous, and, indeed, if at a charging animal of dangerous type it were desired to fire both barrels together, the two triggers can be actually pulled together as one, as has been done on not a few occasions by sportsmen in emergency.

Comparing the two shots of a double-barrelled rifle with two shots of a magazine rifle, it can be seen how superior is the former. The magazine rifle requires the sportsman after firing one shot to loose the grasp of the stock and take his hand away from the trigger in order to open his breech, eject his cartridge, push forward the bolt to carry the cartridges from the magazine into the chamber—operations which take a few seconds of time for accomplishment—in which time a mishap may have ensued or the game may have got out of reach.

With perfectly constructed modern rifles, miss-fires seldom happen, but they are serious possibilities to be faced. The necessity of a quick double shot may not frequently arise, but when it does, the double rifle is there to supply the instant need, where the magazine would fail. Likewise, in the case of a miss-fire with the first barrel, the double rifle provides an immediate second shot to nullify this possible effect, whereas in the case of a miss-fire with the magazine rifle, the amount of time required to re-charge might prove fatal. As a matter of fact, three shots can be fired quicker from a double rifle than three shots from existing magazine bolt rifles. Again, the double rifle, in regard to the quality of noiselessness in its action, must be placed before even the single loader, and in this respect possesses an unique recommendation for sporting purposes. As the highest type of sporting weapon, the double-barrel system has long held sway, and it is difficult to conceive a system which can replace it.

To summarize the conditions it offers—

1. It is most sportsmanlike.
2. It is more quickly fired than any system offering two shots.
3. It is therefore safer.
4. Its construction is familiar to the wing shot.
5. Its balance and general handiness are superior to the magazine or single loader.
6. Practically noiseless in action.

In earlier times the double-barrelled rifle was disparaged by some critics on account of the supposed difficulty of constructing the two barrels to throw their shots accurately together. This was a charge that was unjustly levelled in those days, at all events, at the highest type of double-barrelled rifles, although to construct them with such a degree of accuracy as was desirable, demanded skill of no mean order. Such skill, even when exhibited to the full, although insuring the flight of the bullet to sporting distances equal to that which can be obtained with any single-barrel rifle, could not increase the standard of accuracy obtaining at that day, but nevertheless, the highest accuracy in the best rifles by the best makers was secured. To-day, when the standard of accuracy owing to the introduction of nitro powders, nickel bullets, and increased spiral of rifling has reached a higher mark, the best riflemakers still maintain with their double rifles a degree of accuracy which no single rifle at sporting ranges can surpass, and this shows that the skill of the rifle constructor has advanced proportionately with the demand for increased reliability to meet the stress imposed by the enormous pressures of modern ammunition.

High-class double-rifle barrels are, as a matter of fact, so solidly constructed that under these increased pressures they will maintain for many years their high degree of accuracy unimpaired.

DOUBLE ·577 ONE-TRIGGER RIFLE, 100 GRS. CORDITE. 750 GRS. BULLET. RANGE 100 YARDS. TEN CONSECUTIVE SHOTS IN $3\frac{1}{4} \times 2\frac{3}{4}$ INCHES.

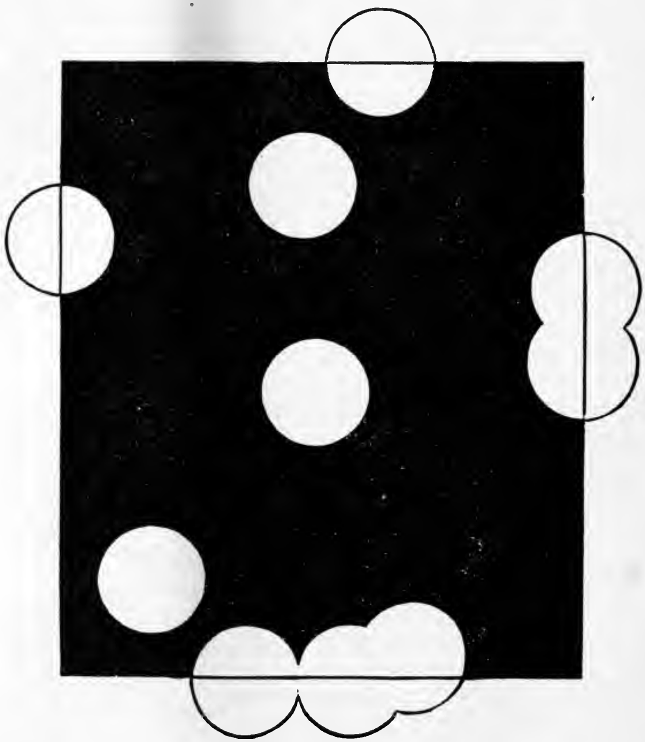


FIG. 77.—DIAGRAM MADE BY A DOUBLE ·577-BORE RIFLE AT 100 YARDS. ACTUAL SIZE.

If we take ordinary single loader, magazine, and double rifles of the same bore, firing the same ammunition under equal conditions, it will be found that the high-class skilfully-constructed double rifle will hold its own in point of accuracy to 500 yards, and will stand equal wear and tear.

While the standard of accuracy set for express rifles of the past accepted a 6-inch diagram at 100 yards, there were a few rifle-makers whose weapons could throw a group of shots into a still smaller area, say 4 to $4\frac{1}{2}$ inches. This was considered an exceptionally fine diagram. High-velocity modern rifles of the finest type, issued by the best makers, are now constructed to shoot within a 4-inch standard, and very fine examples to shoot ten consecutive shots at 100 yards in less than 4 inches.

DOUBLE RIFLE ·256-BORE. TEN CONSECUTIVE SHOTS AT 100 YARDS IN $2\frac{5}{8} \times 2\frac{1}{8}$ INCHES. EIGHT SHOTS IN $1\frac{3}{4} \times 1\frac{5}{8}$ INCHES.

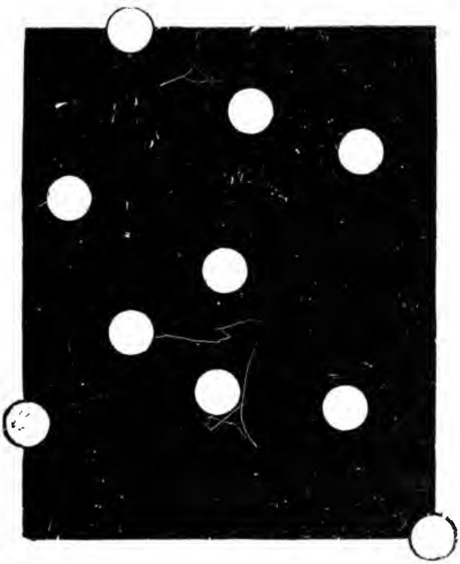


FIG. 78.—DIAGRAM MADE BY A DOUBLE ·256-BORE RIFLE AT 100 YARDS. ACTUAL SIZE.

In proof of this superior standard of accuracy I give an authenticated diagram of ten consecutive shots, five each right and left at 100 yards, made with a heavy double high-velocity rifle ·577-bore weight, shooting 100 grs. cordite and 750 grs. nickel bullet. It will be seen (Fig. 77) that all the shots occupy a space of $3\frac{1}{4}$ by $2\frac{3}{4}$ inches, truly a remarkable performance at this distance for so heavy a rifle.

A double ·600-bore, shooting 100 grs. cordite and 900 grs. bullet, for six consecutive shots was even better, all shots occupying a space of $3\frac{3}{4}$ by $1\frac{3}{4}$ inches. This rifle was built by Westley Richards (No. 8657), and the shooting was made on February 5, 1906.

In order to compare with the foregoing shooting, accomplished with heavy big-game rifles, I give a diagram showing the fine work that may be done with the smallest calibre high-velocity double rifle. This was a double ·256 (Mannlicher cartridge), from which ten consecutive shots were placed in $2\frac{5}{8}$ by $2\frac{1}{8}$ inches, or eight shots in $1\frac{3}{4}$ by $1\frac{5}{8}$ inches (*vide* Fig. 78).

WEIGHT OF HIGH-VELOCITY NITRO EXPRESS DOUBLE RIFLES, TOP LEVER HAMMERLESS EJECTOR, PISTOL GRIP, CHEEK PIECE.

Double Rifle as above, ·256-Bore.

Length of barrel, 26 inches.
Cordite, 31 grs.
Bullet, 160 grs.
Weight, 8 lb. 15 oz.

Double Rifle as above, ·303-Bore.

Length of barrel, 28 inches.
Cordite, 31 grs.
Bullet, 215 grs.
Weight, 8 lb. 10 oz. to 8 lb. 12 oz.

Double Rifle as above, ·375/·303-Bore.

Length of barrel, 28 inches.
44 grs. Axite.
Bullet, 215 grs.
Weight, 8 lb. 10 oz. to 8 lb. 12 oz.

DOUBLE RIFLE AS ABOVE, ·400/·360-BORE.

Length of barrel, 28 inches.
Cordite, 41 grs.
Bullet, 314 grs.
Weight, $8\frac{1}{2}$ to $8\frac{3}{4}$ lb.

DOUBLE RIFLE AS ABOVE, ·375-BORE.

Length of barrel, 28 inches.
Cordite, 40 grs.
Bullet, 270 grs., or cordite 40 grs. and 320 grs. bullet.
Weight, $8\frac{1}{2}$ to $8\frac{3}{4}$ lb.

DOUBLE RIFLE AS ABOVE, ·400-BORE.

Length of barrel, 28 inches.
Cordite, 60 grs.
Bullet, 400 grs.
Weight, 9 lb. 6 oz. to 9 lb. 12 oz.

DOUBLE RIFLE AS ABOVE, ·450/·400-BORE.

Length of barrel, 28 inches.
Cordite, 60 grs.
Bullet, 400 grs.
Weight, 9 lb. 6 oz. to 9 lb. 12 oz.

DOUBLE RIFLE AS ABOVE, ·450-BORE.

Length of barrel, 28 inches.
Cordite, 70 grs.
Bullet, 480 grs.
Weight of rifle, $10\frac{1}{2}$ lb.

DOUBLE RIFLE AS ABOVE, ·500/·450-BORE.

Length of barrel, 28 inches.
Cordite, 70 grs.
Bullet, 480 grs.
Weight, $10\frac{1}{2}$ lb.

Double Rifle as above, ·500-Bore.

Length of barrel, 28 inches.
Cordite, 80 grs.
Bullet, 570 grs.
Weight, 10¾ to 11 lb.

Double Rifle as above, ·577-Bore.

Length of barrel, 26 inches.
Cordite, 90 grs.
Bullet, 650 grs. (Also lighter charge, 560 grs. bullet.)
Weight, 11½ lb.

Double Rifle as above, ·577-Bore.

Length of barrel, 25 inches.
Cordite, 100 grs.
Bullet, 750 grs.
Weight, 12½ to 13 lb.

Double Rifle as above, ·600-Bore.

Length of barrel, 25 inches.
Cordite, 100 grs.
Bullet, 900 grs.
Weight, 16¼ lb.

There are lighter charges in ·400, ·450, and ·500-bores for those who require less powerful weapons, but the weights of the rifles would be practically the same as here given.

A further slight modification of these weights would result from the use of shorter barrels, and, personally, I think that barrels need not be longer than 26 inches.

DOUBLE RIFLES WITH ONE-TRIGGER MECHANISM.

The author of *Guns and Game*, etc., Mr. Evan G. McKenzie, gives an interesting account of experiments conducted by the

County Gentleman in conjunction with the late Mr. R. W. S. Griffiths, which went far to prove that the rebound from the shoulder of the gun after firing, occurred at a period of time $7\frac{1}{2}$ times later than the involuntary pull; and therefore it was assumed that the double discharge of a one-trigger gun was never due to the rebound of the gun from the shoulder.

It, however, may be said that all instances of double discharge are not necessarily of a simultaneous character, the cause of which was the principal point of their investigation; because a sportsman who involuntarily fires his second barrel, even at a fairly long interval of time after the first barrel has been fired (through the rebound of the gun from his shoulder causing the trigger to come in violent contact with the finger), always alleges that under these circumstances his gun has double discharged. And so it has, although not simultaneously. Considering that the rebound after recoil is taken on the average of three-tenths of a second or more, it still occurs in an extremely rapid period of time, so rapid that before the mind has grasped the fact of what is going on, the rebound has passed and the second barrel fired without the sportsman being able to prevent it.

It is, therefore, desirable to have a one-trigger mechanism which is insensible both to the convulsive operation of the finger which causes an involuntary pull; and to the violent blow of the finger against the trigger subsequently occurring, caused by the concussion of the gun against the shoulder and its subsequent rebound therefrom.

Seeing that the experiments reveal the fact that the second barrel under an involuntary discharge is fired on an average of one-fiftieth of a second after the first barrel has been fired, I think that they furnish the strongest argument against a timed mechanism. It is practically impossible to make an efficient mechanism timed to act with such exactitude that it can control the lightning speed of the involuntary pull or the subsequent movement of recoil. Consequently, it is absolutely necessary to construct one-trigger mechanism which, in its action, does not have to take into account either the involuntary pull or the subsequent rebound of the gun from the shoulder.

Owing to this inherent defect in timed mechanisms, and to the further difficulty presented by the increased weight of their recoil, it has not until recently been found possible to construct reliable double rifles on the one-trigger system.

The only mechanism with which I am familiar that acts independently of recoil is the Westley Richards, and with this mechanism double rifles from ·256 up to ·450 and ·577-bores can be constructed to act with reliability, and, as a matter of fact, have been in satisfactory use for some years. The reason of this is that the mechanism is so arranged that it does not have to take into account the force or duration of recoil; nor the personal element, inclusive of that muscular tension or nervous action which varies with each individual and under different circumstances.

As we have seen, each barrel is independent of the other, and in the case of a miss-fire with one there is no third pull, and consequently no delay in manipulating the second barrel.

SPECIFICATION OF A MODERN DOUBLE-BARRELLED SPORTING RIFLE.

System of action, automatically-cocking hammerless.
Top lever, treble grip fastening.
Shell ejector.
Detachable locks with duplicate pair of interchangeable locks.
Spare strikers.
Steel barrels, 26 to 28 inches long (28 inches is not necessary).

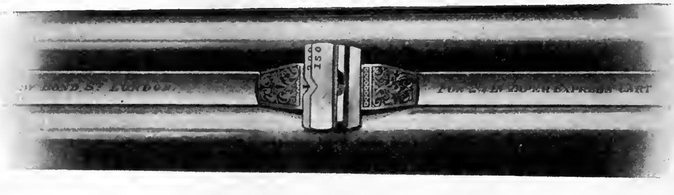


FIG. 79.—TOP RIB SUNK BETWEEN BARRELS.

Easy cut non-fouling rifling.
Top rib sunk between barrels.

Permitting of low sights to obviate mirage.

Automatic top safety-bolt, fitted with a movable stop bolting the safety slide in order to prevent accidental discharge when carrying the weapon in jungle shooting, or removing it from its waterproof cover when so carried for deer stalking.

Pistol grip stock, with cheek piece.

Fig. 80.—Showing Stop Bolting the Safety Slide. This prevents the slide from being accidentally moved from the safety position.

Iron cap at end of pistol grip with trap for carrying within extra strikers or fore-sights.

Back-sights with fine "V" and platinum line in the centre, or

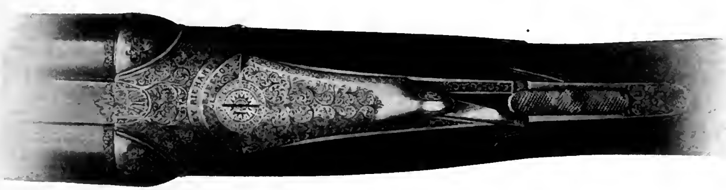


Fig. 81.—Showing Stop moved aside and the Safety Slide pushed forward from the Safe Position.

with platinum pyramid. If fitted with folding leaves, the leaves should be supported by a spring to prevent their being jarred down on the concussion of firing.

Fine bead fore-sight platinum tipped, with lift-up enamel bead.

Extra fore-sights of barleycorn or other patterns.

The fore-sights should be longitudinal and let in from the front, secured by a pin.

Swivels for sling, not loops.

Sling without swivels when used with these barrel swivels prevent rattle.

FIG. 82.—SLING WITHOUT METAL SWIVEL.

Swivels on the barrel to be blued or bronzed, and not bright.

FIG. 83.—METAL CAP WITH SPRING TRAP AT END OF GRIP FOR EXTRA STRIKERS OR FORE-SIGHTS.

Triggers of substantial strength and nicely rounded to prevent injury to the fingers.

The pull off should be heavier than with a shot-gun. The extra weight of the rifle lightens the feel of the ordinary pull-off, which therefore should be adjusted accordingly. This the expert rifle maker will, of course, arrange for; but mere weighing with the steelyards or drop weight to ascertain the actual pull-off in pounds in comparison with that of a favourite shot-gun will not satisfactorily settle the question. It requires skill and judgment;

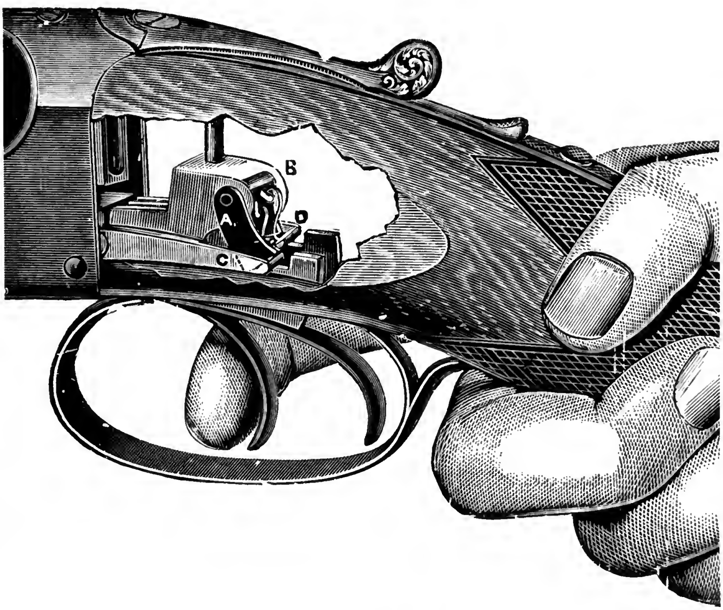


FIG. 84.—SAFETY MECHANISM.

Here, it will be noted, the pulling of the right trigger has drawn back the swinging bolt **A** against the tail of the left-hand sear **C**, and so prevents its movement under the firing of the right trigger. The pulling of each trigger, by this means, bolts the opposite lock.

but no point of detail is of such importance for insuring success in sport. If on your light shot-gun you require only a $3\frac{1}{2}$ lb. pull, on your heavy nitro rifle of nearly twice the weight, you would find a $5\frac{1}{2}$ lb. pull feel no heavier under actual firing.

The ideal rifle will have one trigger for both barrels. This system is quicker to fire, and in an emergency, this is of importance. No possible damage can occur to the shooter's hand through the trigger as in the case of the two-trigger rifle.

If a two-trigger system, the weapon should be fitted with a special safety mechanism in addition to the ordinary safety, for the purpose of bolting the unfired lock during recoil. The pulling of one trigger automatically bolts the opposite lock and prevents the possibility of double discharge which may arise under a heavy recoil. This system, introduced by Westley Richards in 1894, proved most efficient. The jar of the explosion affects the opposite lock through its effect upon the other trigger, which having a certain amount of play freely moves up and down under the shock of firing, and strikes with force against the sear often sufficient to release the tumbler. That is why in a two-trigger rifle it is necessary to nullify the vibration of the trigger by bolting the lock mechanism during the time the recoil lasts. With a one-trigger arm this cause of discharge by recoil is non-existent. There being no other trigger for the recoil to influence, the mechanism remains undisturbed during the recoil from the first barrel.

Given a fastening like the Westley Richards original extension-rib and doll's-head dovetailing into the solid breech, there is no better or reliable fastening for double-barrel rifles than the top lever. Some have argued that for high-power rifles the under lever action is the better. An under-lever action is no doubt better than an inferior system of top lever, but the top-lever system in its original strength has for very many years proved itself thoroughly efficient and durable, having successfully withstood the stress of repeated firing with high-power cartridges from ·256 to ·600-bore. It is much more convenient to manipulate than the under lever, and is therefore to be recommended in preference for double sporting rifles.

It is recommended as a wise precaution for sportsmen to have all weapons fitted with duplicate locks as well as with spare strikers. Duplicate locks in many systems are difficult for the sportsman to remove and attach, but now that hand removable locks are obtainable which can be attached in a few seconds without the aid of tools entirely by hand, there is no need for the sportsman to suffer even temporary inconvenience through any break-down of his locks, even though he is hundreds of miles up country.

Solidity and strength in double and single sporting rifles are qualities of prime importance. The strength which secures the capacity of the rifle to withstand the repeated strain of firing, and so insures the shooter's safety—vital as it is—does not pretend to include the rigidity of all separate parts when combined together. Only high craftsmanship and conscientious work can provide this guarantee, upon which sustained accuracy of shooting entirely depends. In order to prevent the stock springing from the action under the jar of firing, various devices hitherto have been resorted to. Some encased the grasp of the stock in a metal sheath, others have sought to bind the action and stock more closely by extending the iron strap of the action over the top of the hand, and partly along the comb or ridge of stock. Both these methods involve the cutting away of the stock and thereby weaken the very parts requiring strength. There is only one method of obtaining rigidity and strength of combined parts, and that is good workmanship. The wood should be hard and tough; the system of weapon one that can assure reliability, and the screwing together of the wood and iron parts should be faultless. With these assured, the outside aids or supports mentioned are best absent.

The question of battery depends upon circumstances. For an expedition in Africa we would recommend the following—

A pair of 8 or 10-bore ball and shot-guns of the best type.

A pair of high-velocity rifles, ·450-bore.

A double ·577-bore rifle, shooting 100 grs. of powder and 750 grs. bullet, and

A 12-bore "Explora" ball and shot-gun, or

A 20-bore "Fauneta," also

A single loader, chambered for the ·375/·303 or ·318 Accelerated Express cartridge.

The following would also form an excellent battery for Africa—

A pair of high-velocity rifles, ·577-bore, shooting 100 grs. of powder and 750 grs. bullet.

A pair of Accelerated Express rifles, ·375/·303 or 318-bore.
A 12-gauge "Explora" or a 20-gauge "Fauneta," and
A single ·375/·303 or ·318-bore rifle.

A moderate battery for Africa and India would consist of—

A ·318-bore magazine rifle or an Accelerated Express rifle of other bore.

A heavy ·577-bore double rifle.

A 12-gauge "Explora" or other good ball and shot-gun in addition.

Some authorities consider sufficient a 12-bore ball and shot-gun and a ·400 or ·450-bore cordite rifle.

Many sportsmen would manage well on a nitro-expansive Express rifle ·400 or ·450-bore, and a 12-gauge "Explora" ball and shot-gun, or a 20-bore "Fauneta."

Rifle-and-Shot-Guns.

The rifle-and-shot-gun is a double barrelled weapon, and derives its title from having one barrel constructed for the ordinary shot cartridge, and the other barrel rifled and chambered to shoot a rifle cartridge and bullet.

They are extremely useful and effective weapons for mixed shooting, and have long been popular in Cape Colony and other parts of South Africa, and they still continue in large use at the present time.

The principal patterns are made with one barrel 16- or 12-bore for shot, and the other for ·450-bore cartridges. Considerable numbers have been made and are in demand to-day on the following lines—

1. Right barrel, 16-bore ordinary cartridge.
2. Left barrel, ·450, for Westley Richards No. 1 Carbine cartridge.
3. Charge, 55 grs. black powder.
4. Bullet, 380 grs.
5. Sighted to 1000 yards.
6. Weight, 8 to 8¼ lb.

1. Right barrel, 12-bore ordinary cartridge.
2. Left barrel, ·450 for Westley Richards No. 2 Musket cartridge.
3. Charge, 76 grs. black powder.
4. Bullet, 480 grs.
5. Sighted to 1200 yards.
6. Weight, 8½ lb.

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1. Right barrel, 12-bore ordinary cartridge.
2. Left barrel, ·450 for Martini cartridge.
3. Charge, 85 grs. black powder.
4. Bullet, 480 grs.
5. Sighted to 1200 or 1500 yards.
6. Weight, 8¾ lb.

Other combinations exist, some taking the short range Express cartridges of the same bore or larger bore.

Since the introduction of the ·303-bore, there has been a growing demand for a combination weapon having the right barrel 16-bore, left barrel ·303 for Service cartridge; weight, 7¾ lb.; or, right barrel, 12-bore, left ·303 for Service cartridge; weight, 8¼ to 8½ lb.

The long range accuracy of the ·303-bore cartridge for African sport being a special recommendation for buck shooting, there is no doubt that these combinations will become more and more popular amongst South African sportsmen.

The longer range ball and shot-guns of the "Explora" and "Fauneta" types, which recently have come into use, make excellent substitutes for the rifle-and-shot-gun, and possessing as they do the important advantages of greater lightness and better balance, doubtless will also successfully appeal to sportsmen throughout our South African Colonies.

To clean Rifle Barrels after using Nitro Powder.

If possible, pour boiling water through the barrel. Wipe dry and apply oil or vaseline.

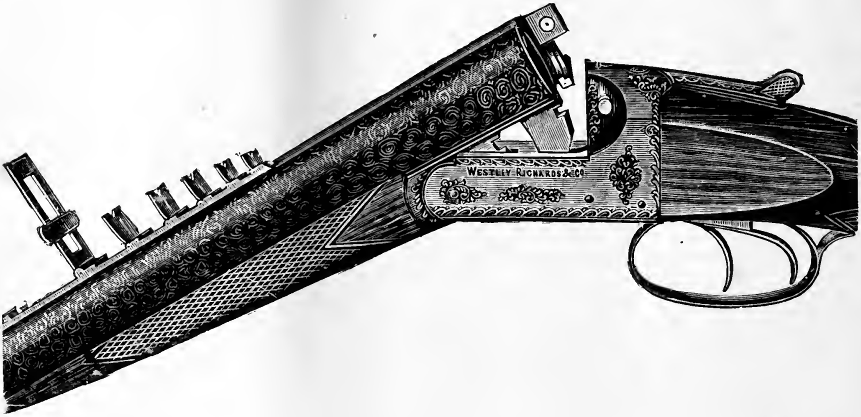
A Cleaning Fluid for Nitro Barrels.

Dissolve caustic soda in methylated spirits until saturated. A wine-glass of this to a pint of Rangoon oil; use liberally.

The barrels should always be cleaned after a day's firing; and in addition should also be wiped through the following day.

Swansdown wipes are recommended in preference to tow.

When not in use, after thoroughly cleansing the barrel, swansdown wipes, smeared with vaseline, placed both at the breech and muzzle ends, are preventives of rust. The interior of the barrel should be examined and wiped out from time to time.



Hammerless Rifle-and-Shot-Gun for South African Sport.

CHAPTER IX

THE NEW ACCELERATED EXPRESS RIFLES AND AXITE POWDER

UNTIL very recently the Mannlicher rifle, ·256-bore, represented one of the highest velocity small-bore weapons. It has a muzzle velocity of 2433 feet per second, but this was slightly lower than the velocity of ·236-bore, the United States Navy Lee straight-pull rifle, the velocity of which is 2489. The ·236-bore has since been discarded, we may therefore accept the Mannlicher ·256 as heading the list of the small-bores. This rifle, however, has now in turn been outclassed by the introduction of ·375/·303-bore, which shoots the Kynoch new Axite cartridge. This cartridge was tested in double and single rifles, designed and manufactured by Westley Richards, at a demonstration attended by officials from the British War Office and Admiralty, by representatives of the Japanese, Russian, Italian, and other Governments, as well as by the chief gunnery experts, prominent gunmakers, and representatives of the principal sporting and daily newspapers, which was held at Kynoch's works, Witton, on June 27, 1905, when the following results were obtained—

·375/·303 Axite Cartridge with 200-gr. Bullets.

Velocity, 2726 feet per second.
Pressure, 20·95 tons.

·375/·303 Axite Cartridge with 215-gr. Bullets.

Velocity, 2498 feet per second.
Pressure, 19·24 tons.

In comparing the Government service ·303 cordite cartridge with the same cartridges loaded with Axite, the results were as follows—

·303 Cordite Cartridge.
Velocity, 2010 feet per second.
Pressure, 15·67 tons.

·303 Axite Cartridge.
Velocity, 2179 feet per second.
Pressure, 15·76 tons.

From this we learn that the Axite powder gives an increase in velocity with practically the same pressure. At this public demonstration the accuracy obtained by Axite loaded in a ·375/·303 cartridge was shown by firing seven rounds from a machine-rest at a target fixed 100 yards from the shooter, and the result was that six of the seven shots could be covered by a penny-piece, the other shot being just outside. Since then, at the Westley Richards range, I have seen made a diagram by one of the rifles at 100 yards range of seven shots, fired from the shoulder, all within a space which a halfpenny-piece would cover.

Fig. 85.—Seven Shots on a Halfpenny.

Axite possesses lubricating action which avoids friction and nickeling, increases velocity, and conduces to greater accuracy. At the Kynoch trials an increase of velocity, due to the lubricating effect of Axite, of 97 feet per second was obtained. Axite is comparatively free from those erosive and corrosive results which are difficulties always present with cordite powder.

Both gunmakers and sportsmen have experienced great trouble in dealing with the corrosive effect of cordite, and no matter what the care exercised in cleaning the barrel it was practically impossible to entirely remove the chemical residue, which invariably sets up fouling or rust which seems to exude from the pores of the metal. Erosion had a very deleterious effect upon the boring, principally at the breech-end near the cone, frequently eating away the lands of the rifling and pitting the barrel in other parts. The trials I have alluded to seem to prove that these objections have been removed, which is a cause for gratification. A rifle was there shown from which ten charges had been fired twenty hours previously without cleaning the barrel. The barrel after this time was in the same condition as it was twenty hours before, and when it was wiped out with a Government "pull-through," it was found to be absolutely uninjured.

In order to facilitate cleaning the barrel after firing cordite powder, the use of cordite soap or a similar preparation was often

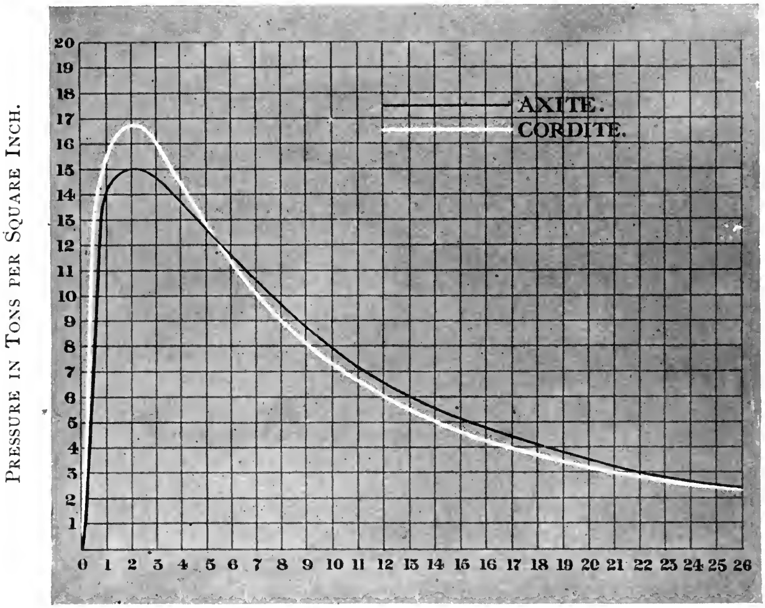


FIG. 86.—TRAVEL OF BULLET IN INCHES. COMPARATIVE PRESSURE CURVES AT EQUAL VELOCITIES WITH ·303 SERVICE AXITE AND ·303 SERVICE CORDITE.

resorted to. This is no longer necessary, a boon the sportsman will appreciate. The treatment of barrels when using the Axite cartridge, in fact, should be exactly the same as for black powder. The barrel should not be wiped out or oiled while still hot, as the oil will remove the protective coating and so make it liable to rust. Rust will make subsequent thorough cleaning more difficult. At the Bisley meeting of the National Rifle Association in 1905, Mr. Caldwell shot his Axite rifle right through the Match Rifles Series, and in the Elcho Match it was not until he had fired at

900 yards distance that a wire brush was put through the barrel. This was done for the sake of safety, as it was a very hot day; the scratch brush was not, even then, necessary. Great trouble was experienced by other competitors using cordite, and in some cases several barrels were used up by the same man during the first week.

I have alluded to the accuracy of the single loader with the

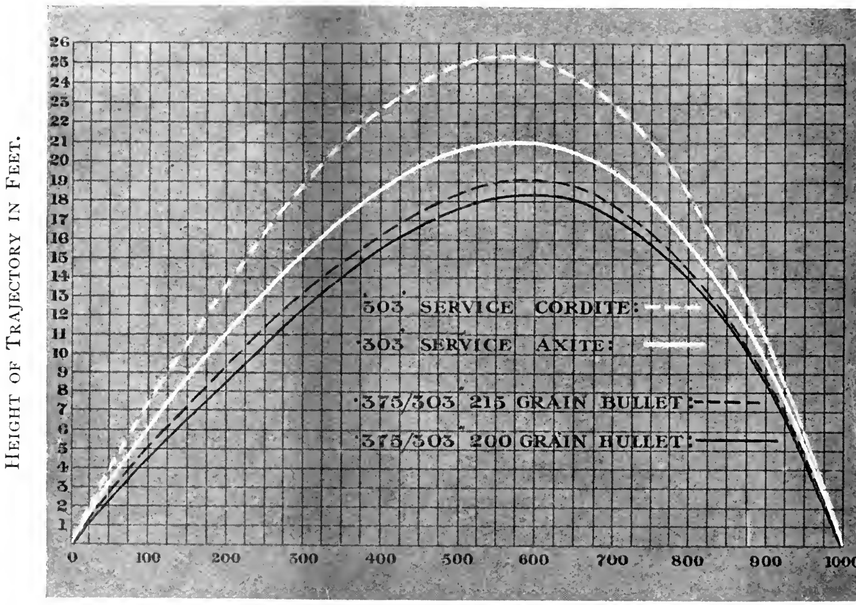


FIG. 87.—TRAJECTORY CURVES SHOWING FLIGHT OF BULLETS OVER 1000 YARDS.

new Axite cartridge, the particulars below serve to show the high standard of shooting when fired from a double rifle.

A Westley Richards double hammerless ejector sporting rifle, No. 15847, weighing 8 lb. 12 oz., was shot at 100 yards range from the shoulder, shooting Axite cartridges ·375/·303 bore with a velocity of 2500 feet per second.

A series of twenty-six consecutive shots, 13 each right and left, were placed within a space of $3\frac{3}{16} \times 3\frac{1}{8}$ inches. Seventeen shots were in a space of 2×2 inches.

At the Bisley meeting, 1905, single rifles constructed expressly for Axite powder were permitted the opportunity of further publicly exhibiting their accuracy at the longer ranges.

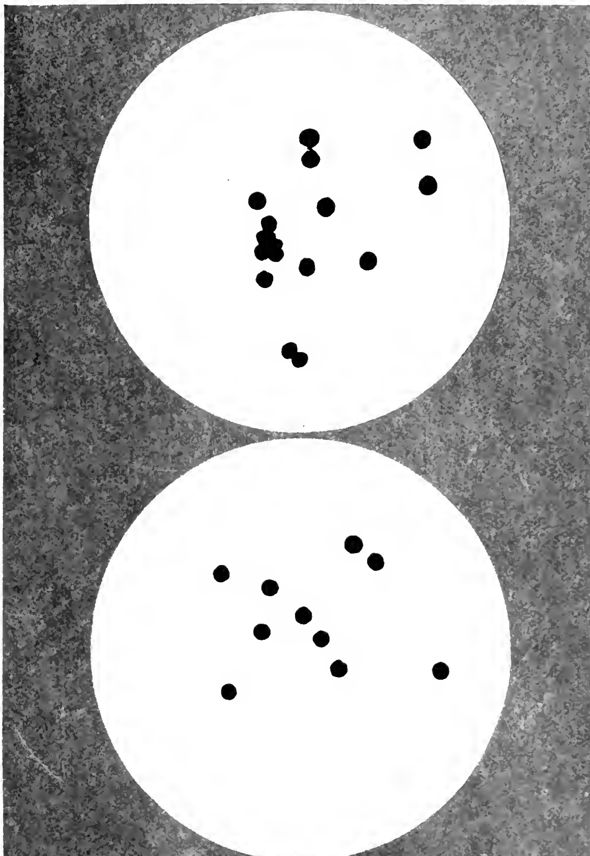


FIG. 88.—DIAGRAMS.

With the Westley Richards Axite rifle ·375/·303, at a distance of 1100 yards, firing fifteen shots, Mr. Caldwell, of the Ulster R.A., won the Wimbledon Cup.

In the Elcho Shield, 800, 900 and 1000 yards, two members of the winning Scottish team used a Westley Richards Axite rifle, Mr. Caldwell scoring second place with 210 points, and Mr. MacGibbon fifth place with 203 points. In the Association Cup Mr. Caldwell scored 49 points out of a possible 50, and there were other minor achievements which go to show that the accuracy of this new powder demonstrated at the public Kynoch trials were confirmed by shooting at Bisley.

The following rifles were used in the Kynoch trials—

No. 1. Westley Richards under-lever action sporting rifle, sliding-block, single-loader, half-stocked, length of barrel, $27\frac{3}{4}$ inches; weight, 6 lb. 15 oz.

No. 2. A magazine rifle with Mauser breech action, military pattern.

No. 3. A magazine rifle with Mauser breech action, military pattern with ordinary tangent back-sight on barrel, fitted with Westley Richards patent wind-gauge and vernier elevating screw, for use with the ordinary military fore-sight. In addition, the rifle was furnished with an orthoptic match back-sight attached to the butt, and for use with the same, an attachable wind-gauge collar fore-sight, with interchangeable sights with disc patterns. The match back-sight was likewise provided with the same patent wind-gauge arrangement, and micrometer divisions on the milled head for readily obtaining minute adjustments.

No. 4. Westley Richards double hammerless ejector sporting rifle, 26-inch special steel barrels, stand-up and five-fold sights to 500 yards, bead fore-sight, enamelled-tipped, anti-recoil heel-plate, pistol-grip and cheek-piece, fitted with Zeiss patent telescope sight with Westley Richards pivoted attachment. The telescope can easily be attached as well as detached, when it is desired to use the ordinary sights. Weight with telescope attachment or bed, 8 lb. 12 oz.

The following are the particulars of this new cartridge, which Messrs. Westley Richards term the New Accelerated Express—

Length of cartridge case, $2\frac{15}{32}$ inches; length of complete cartridge $3\frac{11}{32}$ inches; weight of cartridge, 440 grs., about 1 ounce.

The weight of the bullet is 215 grs., and is made in both solid and copper-capped form. Up to the present time the copper-capped has been made with a cupped or indented nose, but this has been found on trial not to be quite so effective as the rounded nose. It is claimed that the indented nose results in a loss of penetration without increasing the expansion.

The velocities and striking energy are as follows—

Velocity: muzzle, 2500 feet per second; 100 yards, 2279 feet per second; 200 yards, 2074 feet per second; 300 yards, 1119 feet per second.

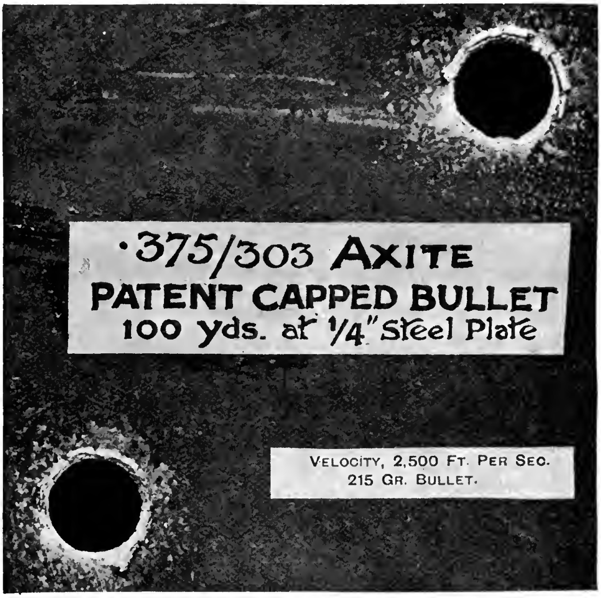


FIG. 89.—THE ·375/·303 CAPPED BULLET AT A STEEL PLATE IN COMPARISON WITH A HIGH VELOCITY ·450 SOLID NICKEL BULLET.

Striking energy: muzzle, 3000 foot-lb.; 100 yards, 2490 foot-lb.; 200 yards, 2076 foot-lb.; 300 yards, 1757 foot-lb.

I give above an illustration of the effect of these bullets fired at a steel plate, in comparison with that produced by a solid ·450 nickel bullet, fired from a high velocity cordite rifle, driven with a velocity of about 2000 feet per second.

It will be seen that the hole in the steel plate made by the ·303-bore capped bullet, is actually as large as that made by the ·450 solid nickel bullet. In fact, the diameter made by the cap bullet is very nearly ·600-bore, an increase of over 60 per cent. on its own diameter. This I consider a remarkable result, and testifies both to the combined penetrative force and expansive quality of the bullet. The cap bullet is the only system which possesses this exceptional combination.

Other interesting trials carried out at the Kynoch demonstration confirmed this point, which is of great interest to sportsmen. In proof of this, the following is extracted from the London *Daily Telegraph*, on June 28, 1905: "A Westley Richards rifle, service charge of Axite, with a patented copper-capped bullet intended for

FIG. 90.—·375/·303 COPPER CAPPED BULLETS EXTRACTED FROM FLESH. RANGE, 100 YARDS.

killing big game, displayed considerable power of penetration against steel plates, at the same time showing wonderful capacity for setting up or expanding so that a hit would be fatal."

Both at live animals and at steel plates, the enormous capacity of the copper-capped bullet is fully exhibited. It will be seen that these trials confirm the peculiar qualities claimed for this system of bullet, namely, while the maximum penetration desired is obtainable, it is coupled with an unusual capacity for expansion. Independent trials testify to the perfect behaviour of the bullet at the flesh of animals.

Above are given illustrations of bullets extracted from these animals. In some cases the wound-channel made by this bullet was 3 inches in diameter. The trials were conducted by Mr. Percy Easte, M.R.C.V.S., who, in his report, states: "The opinion I have formed after these trials is that in the copper-capped you have a bullet capable of inflicting the greatest possible amount of damage, both on hard and soft tissues, with great shocking power, and not too much penetration."

Since these trials, the Accelerated Express Rifles ·375/·303 have been tried in sport in various parts of the world, and many reports are to hand which confirm both their unprecedented accuracy of shooting, and the satisfactory performances of the capped bullet.

One sportsman bagged "a couple of 'Nilgai Bulls,' one being as large as a horse. The first dropped to a single shot through the neck, *the bullet breaking up and not going through.* The other fell to a shot through the ribs, followed by a second through the shoulder. Death was instantaneous with the first, and the second animal dropped dead to a second bullet. Distance, 100 to 150 yards. In no instance did a bullet go through the animal."

And I have also seen an account of this weapon from another sportsman in India, who said—

"It is one of the best killing weapons I have ever used. I have killed about half-a-dozen beasts with it, including tiger. I should use it with confidence on every beast except *perhaps* bison and elephant, for which animals I prefer big bores.

"*The Capped Bullet works splendidly. I have several bullets before me, cut out of animals, and they have all set up in the best possible way.*"

The advantages which this new weapon confers upon the sportsman consist—

1. Trajectory.—This is flatter than the Mannlicher rifle, which, as the highest velocity sporting rifle hitherto made, is the one most affected by sportsmen. The heavier bullet of the New Accelerated Express rifle, *i.e.* 215 grs. as against 162 grs. of the Mannlicher, is of steadier flight and less disturbed by wind.

2. Comparative Striking Energy.—I give below the respective muzzle striking energies of the best-known sporting magazine rifles now in use.

The Mauser, about 2000 foot-lb.
The Mannlicher, ·256, 1900 foot-lb.
The British, ·303, 1920 foot-lb.
The New Accelerated Express, ·375/·303, 3000 foot-lb.

At 200 yards the striking energy of this new cartridge is 2076 foot-lb., or 156 foot-lb. greater than the ·303 service cartridges at the muzzle. For sporting purposes, the accuracy and efficiency of the new Axite cartridge have been fully established, and sportsmen are now able to obtain a weapon far superior to anything that was offered in the past. For military purposes, Axite seems to be of great promise, but only trials extending over a long period of time, in which the effect of the powder upon the barrel and rifling, and also pressure upon the breech-action and other important considerations, will enable us to judge.

There is some objection raised in certain quarters to the bore of this new weapon, but we have not yet seen the latest development of this matter, even considering the immediate future.

Apart from the question of calibre, there is another and perhaps more urgent reason for improving this New Accelerated Express ·375/·303 rifle. This arises through the somewhat imperfect action of the rimmed cartridge when used in the magazine rifle. There are two objections to this cartridge. It does not lend itself, in the first place, to the perfect clip-loading system, and in the second place, it is with difficulty adapted to the magazine action. Both of these causes may result in occasional jamming, which are due to the presence of the rim. The best types of magazine rifles are clip-loaders with rimless cartridge, and the latest improvement is a high velocity accelerated express cartridge, clip-loader and rimless case, of the Mauser type, which can be stripped off by hand readily into the magazine of the rifle. Messrs. Westley Richards & Co., who designed it, have submitted to me a rifle and cartridge on the magazine principle, which is adjusted for a clip-loader cartridge of the type described, as follows—

Calibre, ·318.
Weight of bullet, 250 grs.
Type of bullet, solid nickel and patent copper-capped expanding bullet.

Powder, self-lubricating Axite.
Muzzle-velocity, 2400 to 2500 feet per second.
Muzzle energy, 3194 to 3466 foot-lb.
Pressure, 19 tons.
Weight of cartridge, 493 grs.
Length of cartridge, 3·483 inches.

This New Accelerated Express Rifle ·318 bore is the highest of its type, and both it and its cartridge lead the way in the development of small-bore sporting weapons.

The rimless cartridge, however, is not suited to single-falling block-action rifles and double drop-down rifles generally in use constructed for cartridges with rims. This is a great drawback, from the fact that a sportsman having a magazine rifle and a double breech-loading rifle for this ·318 rimless cartridge, would require to carry two different kinds of ammunition—one for each system of weapon. This is to be avoided if possible, both for the sportsman's sake and for the sake of the manufacturer and dealer, who are already unduly troubled with multiplied types of the same ammunition which might well be reduced, and which certainly is a condition of affairs that the authors of new departures should not aggravate.

Messrs. Westley Richards have, therefore, devised a system of double breech-loading rifles and single-loader sliding and falling block rifles which will shoot the rimless cartridge, so that in future a man may use the same type of ammunition both in these weapons and in the magazine loader. This I consider an improvement of vast importance.

The slight increase of bore over the ·375/·303 will not destroy the special characteristics of lightness and handiness which distinguish the small bores, and rightly are of such great value in the eyes of the modern big game hunter.

Westley Richards New Accelerated Express Rifle, ·318 Bore.

Weight of single loader rifle .	$7\frac{1}{4}$ to $7\frac{3}{4}$ lb.
Weight of magazine rifle . .	$7\frac{1}{4}$ to $7\frac{3}{4}$ lb.
Weight of double rifle . .	$8\frac{1}{2}$ lb. to 8 lb. 15 oz.

In Chapter XI I have dealt with the trajectory of modern sporting high-velocity rifles from ·256 to ·600 bores, but the Accelerated Express rifle, ·375/·303, representing as it does the latest development of the modern rifle, stands in a class of its own, and so I deem it best to give below particulars of its sporting trajectories.

A ·375/·303 Westley Richards Under-lever Action Rifle.

Barrel, 28 inches.
Axite powder.
Bullet, 215 grs.
Muzzle velocity, approximately 2500 feet per second.

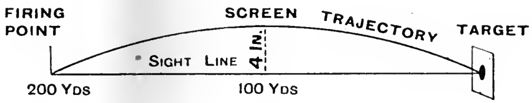


Fig. 91.

Distance of target from shooter, 200 yards. At 100 yards away from shooter was placed a paper screen. The diagram illustrates the point at which the bullet passed through the screen, and shows a rise of 4 inches above the line of sight at this range.

Distance of target from shooter, 300 yards. At 100 yards and

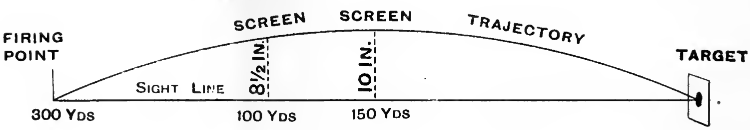


Fig. 92.

150 yards respectively from shooter were placed paper screens. This diagram illustrates the points at which the bullets passed through the screens, and shows over this range a rise of $8\frac{1}{2}$ inches above the line of sight at 100 yards, and of 10 inches above the line of sight at 150 yards.

The following particulars show the exact amount above or below the point aimed at the bullet would strike, under certain errors of taking sight at various distances indicated—

(1)	Shot at	100	yards	with	200	yards sighting, the bullets go	$4''$	high.
(2)	„ „	100	„	„	300	„ „ „ „ „	$8\frac{1}{2}''$	„
(3)	„ „	200	„	„	300	„ „ „ „ „	$8\frac{1}{2}''$	„
(4)	„ „	200	„	„	100	„ „ „ „ „	$8\frac{1}{2}''$	low.
(5)	„ „	300	„	„	200	„ „ „ „ „	$13''$	„
(6)	„ „	300	„	„	100	„ „ „ „ „	$27''$	„

These figures assume that no correction of sighting for the error has been attempted on the part of the shooter, under condition No. 4. A drop of $8\frac{1}{2}$ inches under such circumstances seems a great deal, but it is entirely corrected, as we see in Figs. 94, 95, 96, by taking all the bead instead of half.

Further, as in instance No. 6, when aiming at an animal 300 yards away with the 100 yards sighting, a bullet drop of 27 inches below the point aimed at seems enormous, but again it dwindles to a very small item when we know that all the fore-sight bead and its stem seen through the "V" of the back-sight corrects a 27-inch drop.

As compared with the Mannlicher rifle—hitherto the rifle having, as we have seen, the flattest trajectory—the new ·375/·303 shows itself superior. With this latter weapon, using the 100 yards sight and sighting, that is, taking same aim and amount of bead up to 200 yards, any decent-sized animal would be well hit.

The accompanying diagram, illustrating the actual grouping of shots fired under the conditions of sighting named, prove this. With the 100 yards sight, etc., as described, shooting at the following ranges, viz.—

100 yards all shots are placed at point aimed at.

150 yards all shots measured from centre of group are placed $4\frac{7}{8}$ inches below point of aim.

200 yards all shots measured from centre of group are placed about $8\frac{1}{2}$ inches below point of aim.

This diagram (Fig. 93) also illustrates four shots from the same rifle, fired at 100 yards with the 200 yards sight up, in order to show the actual effect on elevation, if a sportsman should fire under such circumstances. It will be seen that the shots only rise 4 inches above point of aim. Whatever system of sighting is

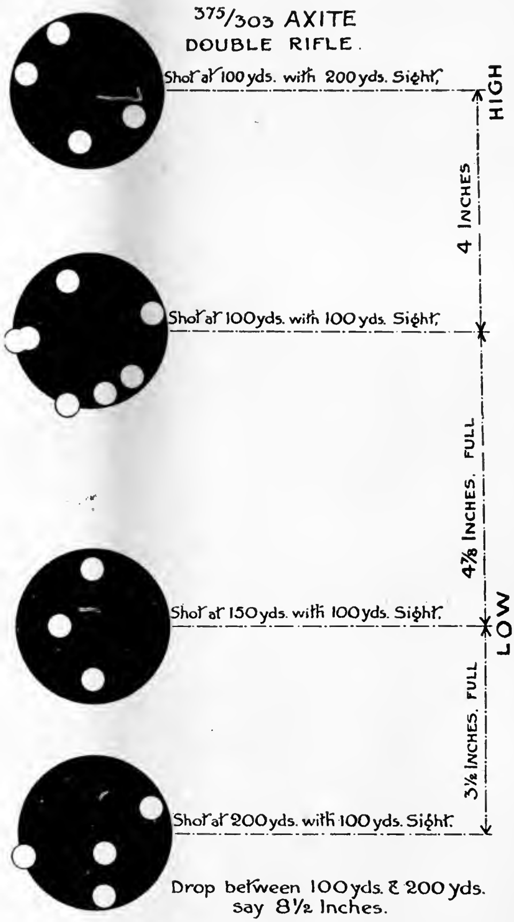


FIG. 93.

adopted an error of aim to this extent is possible, and the sportsman thus sees at a glance what value in inches the error costs him.

There are many sportsmen who will still continue to use standard and folding and leaf sights, but as a matter of fact only one back-sight is necessary for these high-velocity rifles with flat trajectory, if properly constructed. Briefly, this is arranged as follows, aiming with the 100 yards back-sight—

At 100 yards all shots group together by aiming with top of bead as shown.

At 200 yards all shots group together by aiming with full bead, as shown.

At 300 yards all shots group together by taking not only all the bead but the stem as well.

DIAGRAMS.

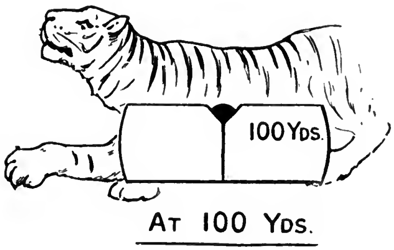


FIG. 94.

Position of shots on animal, distant 100 yards, with 100 yards sight, taking fine bead.

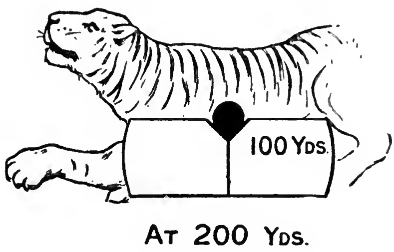


FIG. 95.

Position of shots on animal, distant 200 yards, using 100 yards sight with full bead, correcting a bullet drop of $8\frac{1}{2}$ inches.

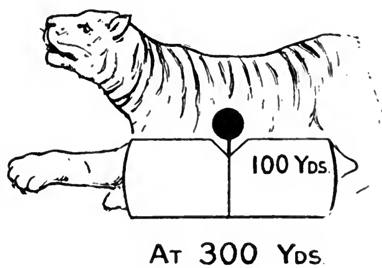


FIG. 96.

Position of shots on animal, distant 300 yards, taking aim with the whole of the bead and stem of the fore-sight showing through "V" of rear-sight, correcting a bullet drop of 27 inches.

Between 100 yards and 150 yards the drop of the bullet would be only 3 inches; allowance in aiming not being necessary.

Between 100 yards and 250 yards, would require the correction of only a very full bead.

Unless a sportsman is familiar with his rifle, and knows the value of more or less bead at the other end, he is liable to over-estimate the allowance required to fairly hit a going-away animal and so shoot over it, scoring a miss, which he might in ignorance easily attribute to the reverse course, *i. e.* under-sighting.

With modern flat trajectory rifles having longer ranging power and more accurate grouping, there is liability to err on the side of making too much allowance, as with the low power high bullet-curve rifles of the past there was to under-estimate the necessary rise in elevation under equal circumstances. In the latter case the difficulty was, on the spur of the moment, to estimate the rise in elevation sufficient to counteract the fall of the bullet. In the former case of high velocity weapons, dealing with a correction which has to be rapidly decided—instinctively as it were—the difficulty is not to over-do it.

A sportsman in possession of these practical trajectory tables, which he can confirm in personal practice, would easily be able to avoid any such error.

For further particulars of the capped expanding bullet, *vide* Chapter XII.

CHAPTER X

BALL- AND SHOT-GUNS AND THEIR DEVELOPMENT

SINCE about the year 1885 these weapons have been used in various parts of the world. Early in this period the principal systems were the Paradox, the Colindian, and the Cosmos. Recently a new type has been introduced by Westley Richards, which is deserving of special mention, as it advances this useful weapon to a larger degree of usefulness.

In the year named, Colonel Fosbery first advanced a system of barrel-boring for the ordinary shot-gun termed "rifle-choke," by means of which one and the same barrel could be made to throw small shot with fair precision at 40 yards range, and also a single projectile up to 80 or 100 yards. This dual purpose was effected by boring the barrel smooth from the breech end to within a few inches of the muzzle, at which point the bore was constricted, this choked portion being rifled throughout.

It will be seen that this weapon differs from the ordinary arm known to us as the rifle for shooting bullets only, and must be considered solely from the special combination provided by the principle, *i. e.* of shooting both shot and bullet from the same barrel of the weapon, which to all intents and purposes in design, weight, and balance is a shot-gun.

In treating of this system it must be borne in mind that its basis is a shot-gun having the weight and general handiness of its kind; and in dealing with the question of accuracy obtainable with the bullet, we must acknowledge that whatever its development in that direction it must always be less than that exhibited by the rifle pure and simple.

Messrs. Holland & Holland, of London, were amongst the first gunmakers to identify themselves with the Fosbery principle, and the sporting public, more especially that section shooting mixed game in foreign countries, was not slow to seize upon the advantages conferred by this system, one gun of this type being practically the equivalent of two arms, viz. a fair cylinder shot-gun and a low-power rifle.

There was nothing striking or novel in the mechanical principle of rifling at the nose. Barrels had previously been rifled at many parts of the bore, and in various ways, and Messrs. Westley Richards inform me that continental weapons of much older date are known to have existed with the muzzle rifled ; and, furthermore, that they themselves and others had made rifling at the muzzle a subject of experiment long prior to the introduction of the Fosbery gun. It is difficult to accurately fix the point at which the Fosbery arrangement becomes entitled to recognition for independent research and development, but it may be conceded that Colonel Fosbery first successfully demonstrated the idea that a smooth-bore barrel having its muzzle rifled could be satisfactorily used with shot as well as with bullet.

Other types of ball- and shot-guns soon followed on the Fosbery system. The barrels instead of being rifled at the nose were rifled throughout with very shallow and almost imperceptible grooves, hence the term "invisible rifling." Even this form varies ; but whatever particular pattern adopted of rifling throughout, while shooting accurately with the bullet, the shot patterns are, as regards distribution, inferior to the rifle choke system. It is a variant, and not a development, and, therefore, needs no further mention.

Previous to these systems the ordinary shot-gun was the only alternative for such a combination ; in addition to firing a shot cartridge, cylinder-bored guns were also arranged to shoot a spherical ball weighing about 600 grs., and at a later period choke-bore guns were also built for spherical ball.

We read in *Big Game Shooting*, Badminton Library series, " one of the advantages which the ball-gun has over the ordinary rifle is its lightness and handiness compared with the latter, but the serious drawback to its wide use was, in the first place, that it would fire spherical bullets only, and consequently lacked penetration ; and in the second, that it gave but irregular shooting except at very short ranges. This state of things was completely reversed by the introduction of the Paradox gun. . . . This weapon fires a conical bullet, hollow or solid, up to 100 yards or more with the accuracy of a good express." As a matter of fact, at this distance it would throw a group of ten shots in from 4 to 6 inches.

The spherical ball was extremely effective and accurate up to 50 yards, and indeed up to 75 yards gave fairly good results. However, it will be seen that the Fosbery invention practically doubled the efficiency of the old smooth bore with ball cartridges.

Excellent shot patterns with ordinary game loads are obtained from these ball- and shot-guns. Sportsmen have been known to use these weapons through an English season's shooting with no little satisfaction, which speaks well for their efficiency as a shot-gun.

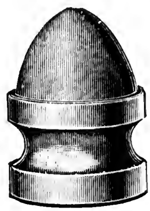


FIG. 97.—THE PARADOX BULLET, 12-GAUGE.

This bullet is also made copper-tubed, and is sometimes cross-cut at the nose for the purpose of expansion.

Beyond 100 yards the best systems of original type, such as the Paradox, Colindian, Cosmos, and others, were not to be relied upon, and, indeed, were not recommended by their manufacturers for use beyond this range, or thereabouts. Even at 120 yards range the shooting became wild, the bullets frequently "key-holing." I have seen that ball- and shot-guns were not reliable beyond 80 yards. Some of the best-made weapons on the most approved system which I have tried have failed to shoot in 20 inches at the short range of 120 yards.[1]

The weight of the conical bullet used in the 12-bore ball- and shot-gun is 750 grs., its diameter is ·734 inch and its length ·982 inch. Even this length was only obtainable by the formation of

[1] The *Field* newspaper on December 19, 1903, authoritatively stated as follows: "The limitation of the ball- and shot-gun is not in regard to striking power, but a matter of range; it is not accurate beyond 100 yards; 50 to 70 yards shows it at its best."

a groove one quarter inch wide in the middle of the bullet, in order to reduce the weight, as shown by the foregoing illustration, representing the actual size of the projectile. Without this groove a bullet of this weight would have been a bluff-headed missile with a capacity for flight scarcely greater than that of the spherical ball, driven by the same velocity, namely, about 1000 feet per second. The extra length obtained by this method of forming the external shape, alone gave accurate flight to 100 yards, or twice the range of a spherical ball. But this bullet, nevertheless, is of stunted proportion, which precludes accuracy beyond 100 yards or thereabouts. It is probable, indeed I believe it to be true, that the ball- and shot-guns of the earlier type have been used successfully up to a range of 140 yards, but this is an exceptional performance that the average weapon could not equal.

Black powder until recently was used with the bullet in these weapons. Cordite a year or two ago was substituted, with the result of lessening recoil and slightly increasing velocity, but without any improvement in the ranging power of the bullet. Both from a mechanical and a sporting point of view the short range of the bullet in this Fosbery gun, and others of similar design and loading, must be regarded as a drawback. Many sportsmen have felt regret that such a handy weapon as the ball- and shot-gun—a weapon so useful in its combination, and firing so powerful a bullet—should have so limited a range when shooting with this bullet. Many practical difficulties stood in the way of improvement; but it was impossible to stand still, and already great strides in advance of the early systems have been made, and we may, without straining imagination, look for even still further developments in this class of sporting arm in the future.

The advent of the long-range ball- and shot-gun has already aroused wide and fresh interest in this system and its development. Long-range shooting with these weapons will henceforth be associated with the name of Westley Richards & Co., who were the first to offer to the public, after twenty years' experience with the original systems, their long-range Explora gun, which they claimed propelled a bullet of the ordinary 12-gauge weight with accuracy up to 300 yards—a claim that has been abundantly justified. It is interesting to note here that this increased range is due principally to the construction and form of the bullet. But in reality this is also true of the Paradox, and other types of ball- and shot-guns which effected the same purpose, although in a lesser degree, namely, an increase in range as compared with the spherical projectile fired from an ordinary shot-gun.

We read in *The Rifle: Theory and Practice* (A. Walker, 1864)—

"We may observe that the projectile forms an even more important part in musketry than the gun from which it is fired."

We find the Belgian, General Borman, in his work on Ordnance stating—

"It is an error to suppose that the value of the system of fire-arms depends upon the gun alone; whether with the smooth or rifle bore, the projectile has always a more extended influence than the piece which throws it."

Sir William Armstrong lays down the rule—

"The projectile should use the gun, not the gun the projectile, for as the shot has to do the work, it evidently must be proper first to determine what kind of missile is required, and then to devise the form of gun best adapted to throw it."

Speaking solely as concerns the bullet, in these weapons of the Paradox type no new principle was introduced, the principle of giving a rotary or spinning motion to a conical bullet by means of rifling was known to be necessary for the flight of such projectile in order to keep it end on; and, under the conditions governing the weapon in question, it was not desirable to attempt to shoot a bullet in 12-bore guns heavier than 750 grs. Such a bullet, made of cylindro-conoidal form, without the external groove characteristic of the Paradox bullet, and weighing 750 grs., would have been too short to carry beyond 50 yards; therefore, as we have seen, the increased accuracy of bullet flight with these early ball- and shot-guns is in a large measure due to the external shape and construction of the bullet, which is hollowed out in the middle and tapered off at the front with the object of obtaining greater length for the purpose of flight than the ordinary form of bullet would have permitted.

Just as the construction of this original form of ball- and shot-gun bullet considerably aided in improving the flight, effecting a twofold improvement as compared with the spherical ball, so has the novel and improved construction of the Westley Richards patent Explora bullets assisted in achieving accuracy to 300 yards or more, by which a threefold advance in point of ranging power has been attained over the Fosbery ball- and shot-gun and others of that type.

Before proceeding to fully describe the Westley Richards Explora system and bullets, it may be remarked that improvements already effected, however great, give promise of even better things in the future. We have seen that we must build all improvements of this system upon the shot-gun basis, and must in no degree alter its characteristic, nor in considering the advancement made confuse its purpose with that of any other weapon of a different character and type. Although some critics and sportsmen have shown a tendency to regard improvements in the bullet's flight of the ball- and shot-gun as an encroachment on the rights and privileges of the rifle proper, they can in no way be considered as doing anything of the kind. They are not capable of comparison. The rifle pure and simple does not, and cannot, shoot shot, and it is therefore useless to attempt comparison of it with a weapon which does shoot shot in addition to the bullet. We must view the progress of the ball- and shot-gun as a weapon of a distinct type; and comparisons of the present standard to which it has arrived must be confined to the standard set up for the ball- and shot-gun of the past. By this means alone shall we obtain the true measure of the advance made.

A writer in the *Field* stated that the velocities, trajectories, and the general ballistics of the ball- and shot-gun did not conform to the modern conditions; but keeping before us the idea of the ball- and shot-gun, and all that it means, whatever improvement has been made on the system represents the modern conditions of that system. It would seem unnecessary to make this statement but for the fact that the *Field* writer gave his authority to an expression of opinion which confuses the issue and might influence a sportsman against an impartial consideration of this question.

The short projectile of the Paradox type for the ball- and shot-gun being incapable of flight to long ranges, the problem presented to the gunmaker was how to provide a means of increasing the length of the bullet without materially adding to the weight. The length of the Explora bullet is 1·4 inch as compared with the Paradox, which measures ·982 inch. It is this length in proportion to weight and diameter which gives superior ranging power to this bullet.

In November 1904, the *Field* newspaper, in commenting upon this new projectile, declared it to be "a bullet of exceptional qualities, having such a peculiar relationship of length to weight." In order to attain this end, Mr. Leslie Taylor invented a new system of constructing bullets. In 1899 he had already obtained patent protection for the use of a solid cap in compound bullets, and in his specification, No. 3897, of 1901, he further applied this principle of fitting the bullet with a light metal cap or forepart to the ordinary lead bullet, and as the words of the specification declare: "The advantages of this arrangement are, that I lengthen the bullet without materially increasing its weight, and greatly increase its accuracy and capacity of flight. By applying this hollow cap to a bullet, I obtain a greater mushrooming up of the bullet upon impact."

There are two advantages secured by this system : (1) Greater accuracy ; (2) increased expansion.

It will be seen that the weight of the bullet was not increased as compared with the short bullet of the earlier system, and therefore no additional weight in the weapon was needed. It remains, as before, to all practical purposes a shot-gun in weight, balance, and handiness.

It may have been possible to obtain accuracy to 300 yards by other methods. The simplest method was the obvious one of making the solid lead bullet of the same length as the Explora capped bullet, and, further, of increasing the powder charge sufficiently in order to propel this heavier bullet to the longer ranges. The weight of this longer bullet as a solid bullet would have weighed 1350 grs. Even when made with a hollow front it would have weighed over 1200 grs., and this would have required a powder charge of about 12 dr. and a weight of weapon somewhere about 15 lb., by which it will be seen that the whole purpose and aim of the ball- and shot-gun would have been destroyed. When we compare this fact with the practical and definite advantages secured by this simple method of bullet construction, as represented by the Explora system, we are able to fairly estimate the benefit which this new design of bullet has helped to confer upon the sportsman.

What are the conditions of the ball- and shot-gun of the past as compared with those of the present? The 12-bore ball- and shot-gun of the past may be summed up as follows—

> Weight of bullet, 750 grs.
> Charge of powder, 3 dr. black.
> Velocity, approximately 1000 feet per second.
> Muzzle energy, 1663 foot-lb.
> Range of bullet, 100 to 120 yards.
> Shot pattern with ordinary game cartridge, equal to a good cylinder gun.

There are two kinds of bullets used, the solid lead bullet and a hollow-fronted lead bullet, with or without a copper tube. The latter possessed very little more qualities of expansion than the former.

The present conditions of the ball- and shot-gun as represented by the Explora system are as follows—

> Weight of bullet, 730 to 750 grs.
> Charge of powder, 35 grs. cordite.
> Velocity, 1270 to 1300 feet per second.
> Muzzle energy, approximately 2700 foot-lb.
> Range of bullet, 300 yards.
> Shot pattern with ordinary game cartridge, equal to that of a good cylinder gun.

There are two kinds of Explora bullets, which widely differ one from the other. A bullet with brass cap or front which is expressly designed for penetration, and indeed has this quality to a degree that is obtainable from a steel-fronted bullet. This cap may also be made of aluminium, but this form is not considered so good. Also, a patent all-lead bullet, which is the antithesis of the former, possessing the greatest degree of expansion, and thus in this respect superior to any other form of lead bullet. Fig. 98 illustrates the Westley Richards brass-capped Explora bullet; Fig. 99 the all-lead bullet, having the external appearance of a solid lead bullet, but hollow within, which causes the bullet to mushroom on impact —sections of these two bullets are given in Chapter XII.

The advantages shown by the modern conditions or development at which the ball- and shot-gun has arrived, show over 25 per cent. increase in velocity, more than 60 per cent. in energy, 300 per cent. in ranging power, and in addition increase of penetration with superior expansion, which will be gathered from the tests that follow. The introduction of the Explora bullets has, I gather, aroused criticism in some quarters, and there are those who have endeavoured to minimize the importance of the improvement, even

Fig. 98.—Westley Richards Brass-Capped Bullet.

Fig. 99.—Westley Richards Lead-Capped Bullet.

going so far as to say that the principle of construction disclosed by the Explora and Fauneta types of bullets had been anticipated, and that they display no novelty.

All authority, as expressed in Military Text-books, and in other sporting works, I may say, fail to show that this view can be upheld. There are, of course, many hidden sources of invention and experiment which are not always to be explored, but I have taken the trouble to consult an old and retired master workman, who spent fifty years of his life in the manufacture of moulds for every conceivable variety of bullet that has seen light during the last fifty years up to the date of the Explora bullet. This interesting individual, of the name of Guy, has made bullet-moulds for all the gunmakers during the period of his working days. He made moulds for bullets on the Forsyth principle, the Lord Keen, the McCleod, the Snider, and for all bullets that had some portion

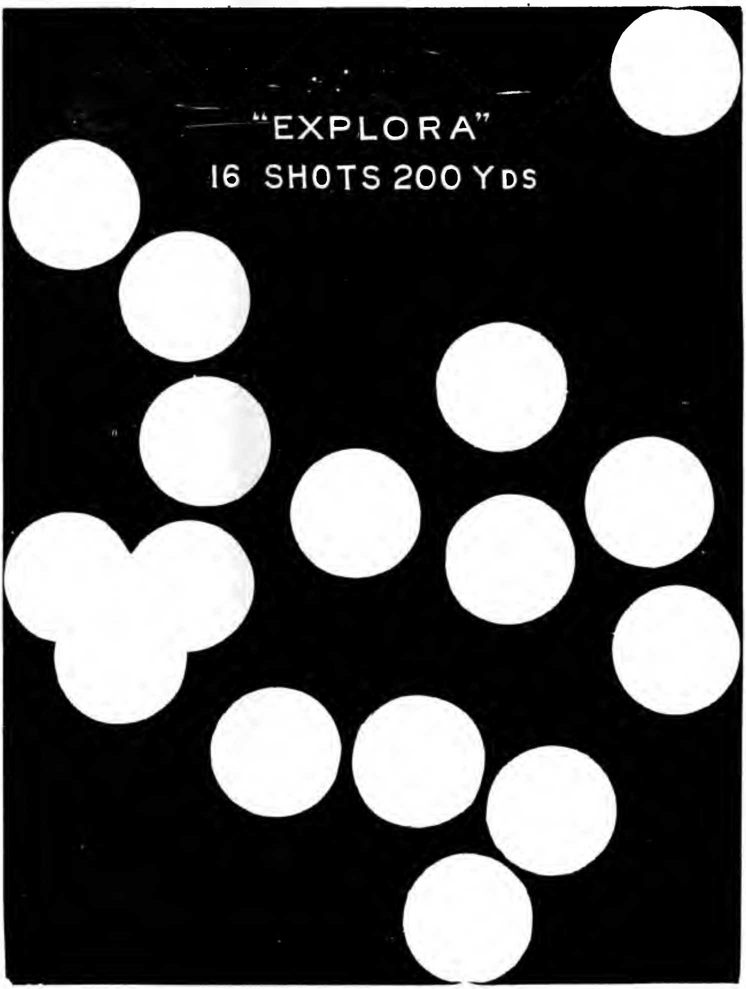


FIG. 100.

16 Consecutive Shots from a Double Explora, 8 each right and left, in a space of $9\frac{1}{2} \times 7\frac{1}{2}$ inches. 14 of these shots occupy a space of $6\frac{1}{8} \times 7\frac{1}{2}$ inches. First 8 Consecutive Shots in a space of $6\frac{1}{8} \times 4\frac{1}{4}$ inches. 200 yards.

of their body hollow, and he informed me that the Explora bullet revealed to him a novel method of bullet construction and produced results in advance of all the bullets with which he was familiar, and he has had experience of every kind, for all purposes, and in all bores.

The following diagrams testify to the accuracy of this system at all ranges—

TESTS.

Westley Richards's double hammerless ejector Explora ball- and shot-gun—

Gauge, 12.
28-inch barrels.

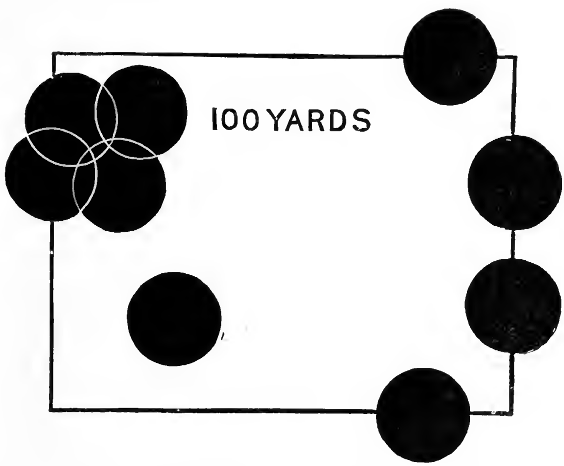


FIG. 101.—TARGET, 100 YARDS, HALF SIZE.

Weight, 7 lb. 2 oz.
Distance, 100 yards.
Charge, 730-gr. brass-capped bullet.
Velocity, 1158 feet per second.
Shot before the editor of the *Field*, November 1904.

Ten consecutive shots, five each right and left, in a space of 5 by 3¾ inches, as illustrated above.

A remarkably fine diagram.

In December 1905 I had the opportunity of conducting experiments with this system at Westley Richards's range at

Bournbrook, Birmingham. Gun of the same weight and description as above, shooting 730-gr. bullet, with a muzzle velocity of 1270 feet per second. Range, 100 yards. The following diagram obtained shows eight consecutive shots, four each right and left, in a space of 2·90 by 3·60 inches.

This diagram has beaten all previous records of ball- and shot-guns for the same minimum number of shots.

The Explora at 150 yards. *Ten shots in a space of* 6 *inches.*

The Explora at 200 yards, 8 by 7 inches, 10 shots.

The Explora at 250 yards, $9\frac{1}{2}$ by $10\frac{1}{2}$ inches.

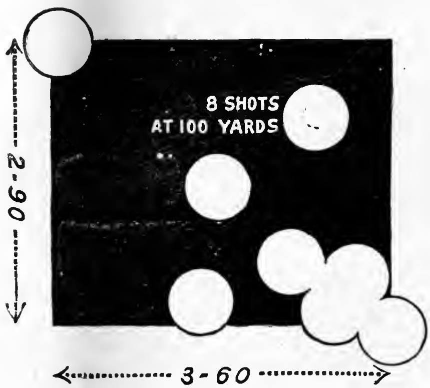


Fig. 102.

At 300 yards, before the editor of the *Field*, a diagram was obtained of 8 consecutive shots in a square with $11\frac{1}{2}$ inch sides.

Since my own trials I have seen a diagram made by a double 12-gauge Explora gun of ordinary game gun weight and pattern; this, with a bullet velocity of 1300 feet per second, placed eight consecutive shots in a space of $2\frac{1}{4}$ inches by $2\frac{1}{2}$ inches at 100 yards. The Explora system, I am convinced, has, in addition to improving the long-range shooting, raised the standard of accuracy at all distances.

In testing the penetration of bullets, both the military and sporting authorities of this country fall into the error of adopting as the medium some substance which does not represent the actual conditions of either sport or war; so we find in military text-books scarcely anything but penetration taken at either steel plates or beech planks or clay, which no doubt represent the behaviour of the bullet at these substances, but certainly it does not inform the investigator as to the bullet's behaviour at the living thing, be it biped or quadruped.

Sporting experts have added to the confusion by choosing another medium, such as putty and dry and wet sawdust, and both authorities have endeavoured to deduce from the good results of trials at these media, conclusions as to the actual behaviour of the bullets at the objects that they have mostly to encounter either in sport or war, and I venture to think that in doing this they have been led astray as to the comparative effect and value of various bullets when used under the actual conditions of sport or warfare.

In order the more fully to test this matter, I prepared a platform at 300 yards, upon which I mounted and secured a huge piece of beef, consisting of the whole of the fleshy part of the hind-quarter, weighing 208 lb.; all bones being removed purposely to avoid any flattening of the bullet except through the medium of pure tissue. The thickness of the beef thus presented as a target was 20 inches or more, a card upon which was marked a 12-inch bull's-eye being placed in front of the beef, and the resultant shooting was as follows—

Brass-capped Explora 12-gauge Bullet. Range, 300 yards.

No. 1. Struck just outside the bull's-eye and penetrated the beef to a depth of 16 inches.

No. 2. In bull, but remained in beef.

No. 3. In bull, penetrated beef to 19 inches.

No. 4. Struck just below the bull, and passed through the beef and into the earth beyond.

Note.—Beyond considerable cupping of the brass cap, these brass-capped bullets when recovered exhibited comparatively slight alteration of form, thus showing their great penetrative quality, for which they are expressly designed.

All-lead Explora Bullet. Range, 300 yards.

No. 1. In bull, pulled up in beef at 15 inches.

No. 2. Just clear of bull, stopped in 10 inches of beef.

No. 3. In bull, penetrated and stopped in 12 inches of beef.

Note.—In all cases the Explora all-lead bullet completely mushroomed. The outer diameter of the head of the mushroom, being $1\frac{1}{2}$ inches, produced very great destructive effect upon the beef.

Firing at a steel plate one-tenth inch thick, at a distance of 300 yards, I find that the brass-capped bullet goes completely through.

The long-range shooting of the Explora ball- and shot-gun

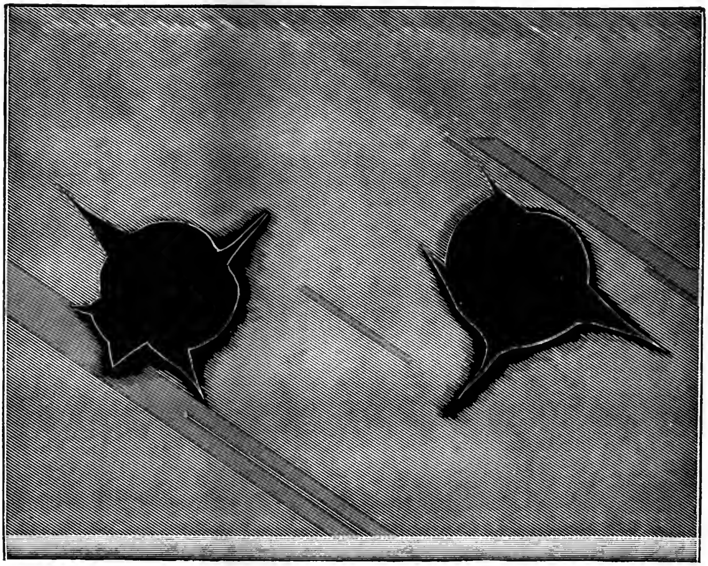


Fig. 103.—Effect of Explora Bullet on Steel Plate.

in no way detracts from its usefulness as a jungle gun for close-range shooting. Sportsmen can use this weapon with the greatest confidence for attacking dangerous game at close quarters, as the following trials show.

It was assumed that the sportsman would have his 100 yards sight in position, and under this condition it was proposed to ascertain what would be the position of the bullet fired at a charging beast at the respective distances of 10, 20, 35 and 50 yards, in comparison with the bullet fired with the same sight at a stationary animal at 100 yards.

Difference in elevation between 10 and 100 yards, with 100 yards sight at each distance, with Westley Richards 12-gauge Explora gun, 730-gr. capped bullet. All shots in a space of $4\frac{1}{4} \times 5\frac{1}{2}$ inches.

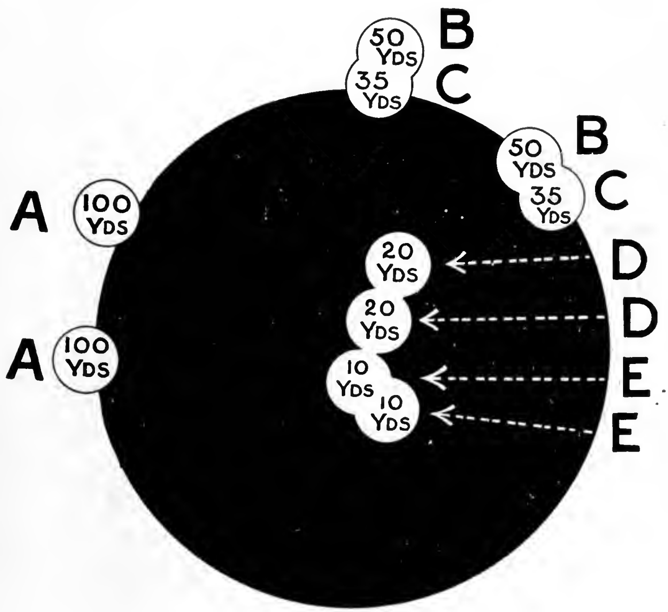


FIG. 104.

A.	Correct sight for 100 yards.					
B.	50 yards range, 100 yards sight.					
C.	35	”	”	100	”	”
D.	20	”	”	100	”	”
E.	10	”	”	100	”	”

It will be seen from the accompanying diagram of the actual position of the shots fired upon the target in this trial, that at whatever distance enumerated, the weapon was fired with the

100 yards sight up—*i.e.* whether we take 10, 20, 35, 50 or 100 yards as the objective, the whole ten shots struck within a space measuring $4\frac{1}{4}$ by $5\frac{1}{2}$ inches.

At each of the five ranges two shots were fired. Taking 100 yards as the standard, it is found that the bullets at 50 yards go $2\frac{3}{4}$ inches high, at 35 yards they go 2 inches high, at 20 yards the shots are practically on a level with those fired at 100 yards, whilst at 10 yards they are only, practically, 1 inch lower.

These being the result of actual experiments, afford a practical guide to sportsmen such as no table of calculated proportions can equal.

In continuation of these trials, it has been found that the drop of the bullet from 100 yards to 150 yards is $8\frac{1}{2}$ inches; or, in other words, supposing a sportsman were aiming with the 100 yards sight up, and the animal should be 150 yards away, the bullet would strike $8\frac{1}{2}$ inches below the point aimed at. In the same way, with the 150 yards sight up, and the animal distant 200 yards, the drop of the bullet below the point aimed at would be $16\frac{1}{2}$ inches. It will be wronging the sportsman to think that at these short ranges his miscalculation of distance could be so great, but they are adduced as extreme cases which, even granting a sportsman may sometimes meet them, are readily and effectually overcome by a moderate allowance or correction of aim, and in respect of this allowance the call upon the skill and judgment of the marksman is insignificant as compared with the same demand which ordinary winged game shooting with the shot-gun lays upon him.

Again, when using the Explora ball- and shot-gun with its bullet at the extreme range of 300 yards, at which distance it was designed by its inventors to be of practical utility, we know that from its accurate grouping and smashing power at intermediate distances, and even to this extreme range, it is capable of thoroughly effective sporting work. It is obvious that this demands sportsmanlike qualities of ability to reasonably estimate distance and some acquaintance with the habits of the game pursued. Much game is undoubtedly caught stationary, and, if it be moving, some knowledge of its action and speed of progress is necessary, and, indeed, this should be a badge and qualification of sportsmanship.

Given these qualities, the Explora ball- and shot-gun may be relied upon to answer to the call of many varieties of sport, from which the short range ball- and shot-gun of the old type was barred. But in the case of the tyro, the man who has yet to gain his experience, and can only gain it from actual sporting experience, we assume that greater errors of judgment, both as regards distance and the habits and movements of game, may be made as compared with those permissible with the full-fledged sportsman. Even in his case, it will be granting the probability of an extreme error to presume that at 200 yards he might be using his 250 yards sight; or, at 300 yards, he might attempt to shoot with the 250 yards sight up.

In the first of these cases, actual experiment has shown that the bullet would go high 20 inches above the point aimed at, and that the sportsman would have to make an allowance of aiming 20 inches low in order to correct his misjudgment of distance; while, in the second place, we find that the drop of the bullet below the point of aim would be 21 inches, and again, in actual trials at the target, I have ascertained that the amount of correction necessary for this misestimation of distance can be met by aiming 21 inches above the object. In both cases, there is practically the same degree of allowance to be made, that is, about 1 foot 9 inches. This may seem on paper an error very difficult to deal with, but in actual sport viewed in relationship to the distances involved, it is one that is well within the capacity of reasonable marksmanship.

If the game-shot at 40 yards should find it necessary to aim a couple of feet above a rising bird, or two or even more feet ahead of a crossing bird, it would not be considered a tax beyond the capacity of the novice. At this distance the amount of allowance mentioned appears to be considerable, but the same amount of allowance at more than seven times the distance is reduced to such small dimensions that the sportsman might almost be said to make the allowance unconsciously. While it is possible that a novice may make an error such as that indicated, we do not think that it in any way represents the average error of which the inexperienced sportsman is likely to be guilty. No tyro desirous of becoming a sportsman would legitimately claim such an allowance, but the duffer, whether tyro or not, might do so.

The foregoing are actual tests, and not calculated results, but whether one or the other, it is incumbent upon the sportsman himself to test the capacity of the rifle, which he could easily do by firing it under various conditions, before he engages in actual sport, in order to familiarize himself with the behaviour of his arm and ammunition, in the same way that it is incumbent upon him to master the habits of the game and the lay of the country in which he operates. This is true whether it refers to dangerous game shot at close quarters or to less dangerous game, which frequently has to be bagged up to 300 yards or more.

The longer range shooting, to 300 yards or more, is necessary in African sport or on open plains with but little cover. In some kinds of Indian shooting, such as hill shooting, where aim has to be taken, say, across and down ravines, 150 yards is, according to some sportsmen, the maximum distance which can be judged accurately. It will, I think, however, be conceded that the long-range ball- and shot-gun, even taking 150 yards as the limit, justifies its existence by being absolutely accurate at this short range where older systems failed.

We have seen that, consistent with the greatest accuracy up to the reasonable range of 300 yards, the weight of the bullet under the existing conditions must be 730 grs. This weight permitted a certain length in proportion to diameter which ensured the desirable accuracy, but improved methods of constructing this form of bullet have already resulted in the production of a lighter bullet of practically the same length as the 730-gr. bullet. The advantages of the lighter bullet lie in the fact that a sportsman can have a gun weighing only 6½ lb., shooting both bullet and shot, a weight that is even lighter than the average shot-gun.

The Explora bullet used in this arrangement weighs only 600 grs., and flies accurately to even 300 yards, with a slight reduction of energy; the energy obtained, however, although lower than that resulting from the use of the heavier bullet, is one that is far above the requirements for ordinary sporting purposes.

The pressures obtained by the present charges of cordite powder and bullet in the Explora ball- and shot-gun are of comparatively low standard even when using the full weight bullet, 730 grs. The maximum pressure obtained under the tests which have been carried out by Messrs. Kynoch, is $3\frac{1}{2}$ tons at the breech, with a maximum muzzle velocity of approximately 1300 feet per second.

Gun and rifle constructors are, therefore, confronted with the further problem of securing an increase in the velocity of the bullet without unduly increasing pressure or lessening the accuracy of the bullet's flight at the reasonable range of 300 yards. Obviously, with the ball- and shot-gun weight, a heavy bullet cannot be propelled with such a velocity that will, to an appreciable extent, advantageously influence the trajectory. Such a provision can only be sought for by lightening the bullet, and using a powder charge that will increase the velocity so as to raise it to the level of the old express rifle.

The old express system we know consisted of a heavy powder charge and a light bullet. Even in this relationship the 600-gr. bullet, for the 12-bore Explora is much heavier in proportion as compared with the bullet and the powder charge of the old ·450 express rifle.

With an Explora 12-gauge bullet weighing 530 grs., a velocity of close on 1400 feet has already been obtained, with a pressure of $3\frac{1}{2}$ tons. At this weight the bullet is constructed of practically the same length as the 730-gr. bullet, which ensures accurate flight to the longer ranges. It is, therefore, not too much to say that even a still higher velocity is within practical reach; a velocity of 1800 yards is the minimum ideal. This attainment is extremely desirable, and will register a very marked improvement in the sportsman's armament. Let us hope that the future sportsman will have at command a 12-bore weapon weighing some 2 lb. lighter than the cordite rifles of to-day, and equally effective for sporting purposes, with the additional advantage of combining with its efficiency as a rifle, utility of no mean order in the shooting of shot like an ordinary game gun.

Weight, Explora gun, 12-gauge, $6\frac{1}{2}$ lb.
Powder, cordite.

Bullet, 530 grs.
Velocity, 1400 feet per second.
Energy, 2318 foot-lb.

The Fauneta Express Ball- and Shot-Gun.

Messrs. Westley Richards & Co. have quickly seized the opportunity of applying the new system to smaller bores. This introduces an important development, owing to the fact that a bullet of a length suitable for accurate long-range flight can be made of a weight approximating to the old ·450-bore express bullet, which can also be arranged to fly with the velocity imparted by this latter weapon, but with the superior advantage of greater accuracy and ranging power, and therefore, as the old express rifle was practically limited to 100 yards range, the new small-bore express ball- and shot-gun increases the accuracy threefold over this reliable weapon of the past.

The weapon that achieves this result is termed by its manufacturers the Fauneta express ball- and shot-gun. It is constructed as follows—

Length of barrel, 26 inches.
Calibre, ·558 inch, approximately 28-bore.
Length of cartridge-case, $2\frac{9}{16}$ inches, metal covered, and special lining.
Charge of powder, 28 grs. axite, or 27 grs. cordite.
Weight of bullet, 290 grs.—(1) brass cap for penetration, (2) copper cap for expansion.
Muzzle velocity, approximately, 1660 feet per second.
Muzzle energy, 1772 foot-lbs.
Ranging power, 300 to 400 yards.
Weight of weapon, about $5\frac{3}{4}$ lb.

In addition to the bullet charge, it shoots a shot charge consisting of 25 grs. amberite powder and $\frac{3}{4}$ oz. shot, with which excellent results from 30 to 40 yards are obtainable.

For deer-stalking and kindred game, it is no longer necessary to carry a double-barrel weapon weighing between $7\frac{1}{2}$ and 8 lb.

The greatest efficiency is ensured with this new Fauneta weapon, which weighs only $5\frac{3}{4}$ lb., and is as light in the hand as a stick. It will be seen from its muzzle energy that the striking force of the bullet is sufficient to bring down the biggest horned animal. The striking force is greater than the original 12-gr. Paradox to the extent of 110 foot-lb. It has been used, so I am informed, with excellent effect at hartebeest, duiker-buck, bush-buck up to 250 yards, and has also performed satisfactorily with shot for feathered game for the pot in British East Africa. In fact, as a "scoff" gun, it would be difficult to beat.

In Cape Colony, where mixed shooting prevails for buck shooting or for bustard, it is exceedingly useful. I am told that no shot-gun of ordinary power is capable of bagging the bustard under their conditions of sport, and that a bullet is usually resorted to for this class of shooting, and it is the long-range capacity of the Fauneta bullet that will especially appeal to shooters of this wild-fowl. It is, further, useful for shooting round the homestead, being so very light it may be handled by a lady for this purpose, or even for more serious kind of shooting should occasion arise, as I am told it frequently does in some parts of the colony.

I have seen a report from an experienced Indian sportsman who stated that, owing to the breakage of the striker in his ·450-bore single weapon, he had to fall back upon his Fauneta, which he reported to be a little ripper. Fuller particulars as to the shooting he had with it have not yet come to hand.

This weapon has also been used with success for stag in Austria, and at the same time for feathered game. In foreign countries where mixed shooting obtains, and where the feathered game is shot at shorter distances than in this country, this weapon should prove of great value to the sportsman.

In order to severely test the killing power of this Fauneta ball- and shot-gun, a friend and myself fired at 24 blue-rocks, first at 18 yards rise and then at 25 yards rise. Out of these 21 birds were dropped in good form, and the remaining three being the only pigeons not dropped within bounds. The charge used was 25 grs. amberite, and $\frac{3}{4}$ oz. shot. I afterwards tried this extremely handy little ball- and shot-gun upon some clay birds thrown over a hedge to represent driven partridges, and broke

40 of these without a miss; in only one instance was the second barrel made use of.

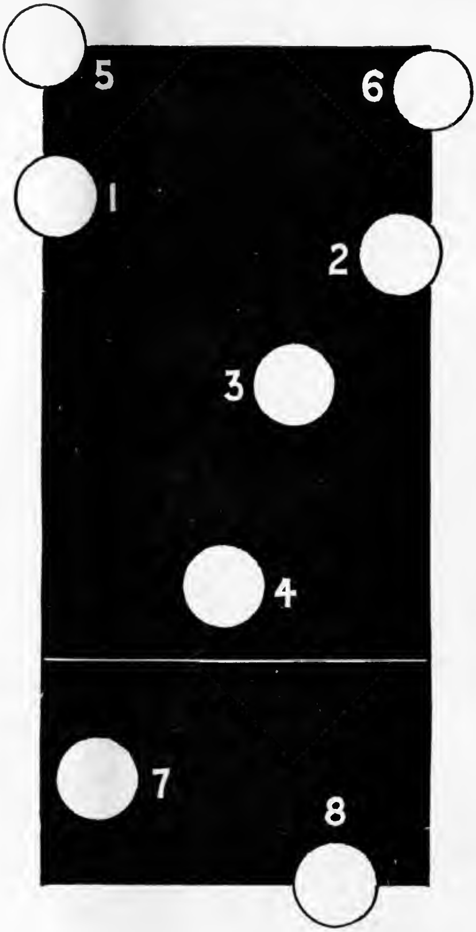


FIG. 105.—"FAUNETA" DIAGRAM, 100 YARDS—ACTUAL SIZE.

The above diagram testifies to its bullet accuracy.

The velocity reaches a higher standard than has hitherto been practicable with the ball- and shot-gun system, and consequently the trajectory is much flatter, and indeed in this respect compares favourably with the old black powder express rifles. It has been ascertained from actual experiment, that with the Fauneta, using axite powder and 290-gr. bullet, firing with the 100 yards sight up at a distance of 150 yards, the shots would fly into the same group as if firing at 100 yards with the same sight. That is to say, shots fired at 100 and 150 yards measured together would occupy a space of 6 inches. The trajectory of the rifle is, therefore, sufficiently low to counteract the miscalculation of 50 yards up to 150 yards, an error of judgment hardly likely to arise with the practised sportsman.

Although a combination weapon, shooting both bullet and shot, the Fauneta may, nevertheless, be considered solely from the rifle

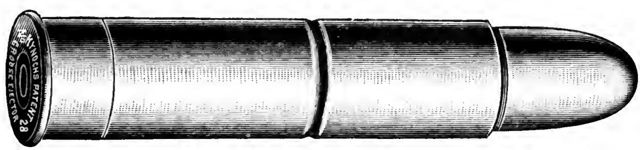


FIG. 106.—THE "FAUNETA" EXPRESS BALL- AND SHOT-GUN CARTRIDGE. 28-GAUGE. WEIGHT OF CARTRIDGE COMPLETE, 510 GRS.; $1\frac{1}{8}$ OZ. FULL.

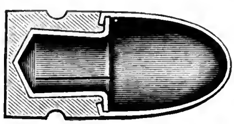


FIG. 107.—SECTION OF SAME BULLET.

FIG. 108.—THE "FAUNETA" CAPPED BULLET (290 GRS.).

standpoint. So judged, we see that it forms a deer-stalking rifle of considerable efficiency and merit. In its energy, ranging power, and trajectory, it compares favourably with the old express deer-stalking rifle; that is its claim to efficiency. Its claim to merit over other types of deer-stalking weapons lies in the extreme lightness and handiness of the weapon. It is handier than a 20-bore, and about as light, and balances beautifully. It should be tried in order to fully appreciate what it means to the sportsman to have a highly effective rifle with double barrel, weighing only $5\frac{3}{4}$ lb. This quality of lightness gives the shooter great advantages over the heavier weapons to which he is at present accustomed. It means greater steadiness, easier alignment, and less fatigue. This, without any drawback in respect to recoil, or indeed any other characteristic.

In addition to the 290-gr. brass-capped bullet, this Fauneta express ball- and shot-gun shoots a copper-fronted or capped bullet of a highly expansive nature. The brass-capped bullet in itself is a very suitable bullet for ordinary sporting purposes, combining a large measure of expansion and penetration.

Having personally tried this Fauneta gun at deer, grouse, and other game, I must agree with the editor of the *County Gentleman*, who witnessed a public trial of this weapon, when he says, "It seems almost incredible that a little weapon that handles like a

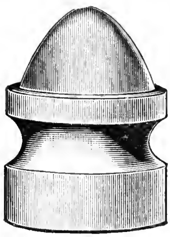


Fig. 109.—8-Bore Paradox Bullet.

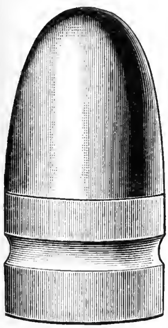


Fig. 110.—Explora 8-Bore Bullet.

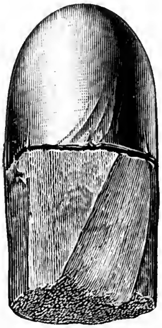


Fig. 111.—Explora 8-Bore Bullet after Firing.

walking-stick can be so deadly with its bullet and so useful with its shot."

I have seen a report from an Indian sportsman, stating that with the No. 9 shot he had been very successful at quail, using the Fauneta, and this confirms my own experience. Better shot patterns would be an advantage, approaching more nearly to those needed for shooting in this country, but these can only be obtained by using a larger bore.

Westley Richards for this purpose have introduced a 20-bore which will shoot an ounce of shot (bare) giving practically the same averages as a 20-bore cylinder gun, and without any sacrifice of the velocity, flat trajectory, and long range shooting with the bullet which distinguish the smaller bore.

I believe this Fauneta 20-bore will be of great service to sportsmen who do not object to a slight increase in weight. The great advantage of the 28-bore is that it is a double rifle as well as a shot-gun weighing only $5\frac{3}{4}$ lbs. The 20-bore constructed on these lines weighs between $6\frac{1}{2}$ to 7 lb., but this weight is not objected to on the part of Indian sportsmen who do not carry their own arms, and will in reality put no tax upon the endurance of an African sportsman.

South African sportsmen are accustomed to sturdy weapons, and 7 lb. is by them regarded as not excessive, in fact, it is considered to be rather a light weight for a combination arm. The 20-bore Fauneta is arranged to shoot a bullet of 320 to 380 grs., and a powder charge sufficient to give a bullet velocity of about 1600 feet per second, and in this case also both the brass-capped and the all-lead bullet are available.

The Fauneta ball- and shot-gun 20- and 28-bores are both made by their inventors as single loaders, using their under lever system of sliding block action with detachable barrel.

The Explora ball- and shot-gun is made in gauges 16, 10 and 8, and in all sizes has proved itself to be a remarkably successful arm. The 10- and 8-bore are especially suitable for some forms of jungle work, where dangerous animals such as the buffalo require a very heavy blow to stop them effectively. Illustrations of the 8-gauge Explora bullets are given on previous page.

CHAPTER XI

THE SIGHTING OF RIFLES—TRAJECTORY

THE sighting of rifles is a matter requiring much care and special knowledge. The utmost exactitude is necessary in all points concerned ; the elevation must be correct, the alignment of back-sight with fore-sight perfect, the shape and cutting of the "V's" or notches accurate.

Many different forms of sights are now attached to sporting rifles ; amongst the principal back-sights may be enumerated—

1. Open sights.
2. Peep, or aperture sights.
3. Telescopic sights.

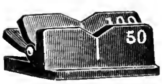


FIG. 112.

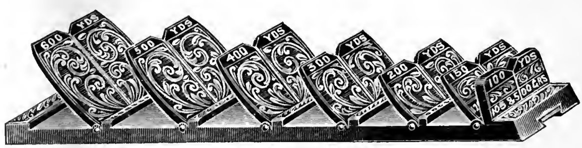


FIG. 113.

The military pattern of tangent back-sight is seldom, if ever, employed on sporting rifles, unless in the case of rifles for South Africa, where it is used in conjunction with the ordinary open-leaf "V" sights, and is essential for the long range shooting there affected.

The form of sighting now most widely used for sporting purposes is that first mentioned, and as here illustrated in two patterns.

In this familiar method the back-sight, as will be seen, consists of a flat bar attached to a bed, situated transversely near the breech end of the barrel, and usually having a notch or "V" cut in its upper edge. This is known as the "standard" or "fixed" sight, and is more frequently accompanied by leaves hinged to the bed, which lie

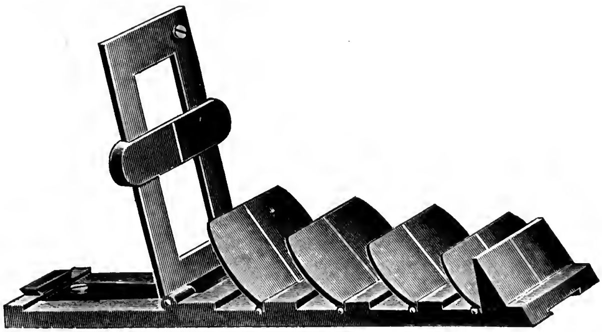


FIG. 114.—FOLDING LEAVES AND TANGENT SIGHTS AS USED PRINCIPALLY IN SOUTH AFRICAN SPORT.

flush with the rib when down, and stand up—the same as the fixed bar—when raised for use. In the better quality rifles these leaves are provided with springs to keep them rigid when shooting ; those without springs soon become loose in wear, and are liable to be jarred down by the explosion of the cartridge.

The pattern of fore-sight mostly used in conjunction with these back-sights is one having a small globe or bead raised on a short

FIG. 115.—BEAD FORE-SIGHT FIXED LONGITUDINALLY IN RIB AND PINNED IN.

FIG. 116.—BEAD FORE-SIGHT DOVETAILED IN TRANSVERSE SLOT ON RIB.

neck or stem attached to its bed, and the actual illustration shows that the form of this fore-sight is more or less elongated and spear-shaped.

These forms naturally are chosen with a view to the correction of lateral movements of the muzzle of the rifle ; thus when the aim is true, the fore-shortened view of the fore-sight then presented appears simply as a bead or globe. The fore-sight is placed upon the barrel in close proximity to the muzzle.

The bead is, as a rule, faced with silver or platinum; the latter

Fig. 117.—Bead Fore-sight with Lift-up Enamel Globe or Night-sight.

Fig. 118.—Bead Fore-sight with Globe down.

for preference. Sometimes it is ivory-tipped, and fore-sights with white enamel facings are also much employed.

In Africa, fore-sights of triangular or barleycorn pattern are supplied in addition to the beadlike or globular form, and these are

Fig. 119.—Barleycorn Fore-sight.

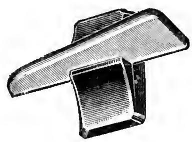


Fig. 120.—American Fore-sight in General Use.

interchangeable at will. Sometimes they are made completely of ivory, and sometimes of iron or steel, faced or plain.

I am told that it is a common practice with Boer hunters, on receiving a sporting rifle from England not provided with ivory

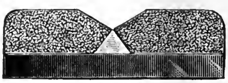


Fig. 121.—Platinum Triangle on Leaf Sight centring the "V."

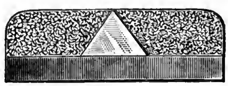


Fig. 122.—Leaf Sight with Platinum Triangle and without the "V."

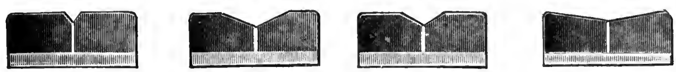
sights, to discard the forms mentioned and fix in a fore-sight made of hippopotamus ivory.

Ivory sights are liable to damage, being too brittle to withstand rough usage, but, of course, when stalking amidst rocks or in a heavily timbered country, a fore-sight protector may be used.

The standard, or leaf, of the back-sight is usually centred by a vertical straight line from its base to the bottom of the "V," to enable the shooter more quickly and certainly to centre his front bead in the notch, as will be gathered by reference to Fig. 112.

Occasionally a platinum triangle, with its apex turned towards the bottom of the "V," is substituted for the straight line (Fig. 121) and in some sights, either with the vertical line or with the platinum triangle, the "V" or notch is dispensed with (Fig. 122). Ivory lines and triangles, or pyramids, are also employed, but ivory is very difficult to work and make secure in its steel setting.

The question of narrow or wide "V's," or of leaf back-sights practically without "V's," but with a wide sloping top edge, is a matter that does not admit of any definite preference. It is one of personal taste, though, given clear strong sight on the part of the shooter, the narrow "V" lessens the chance of lateral



Narrow "V." Medium "V's." Wide-Open "V."

FIG. 123.—VARIOUS FORMS OF "V'S" OR NOTCH ON BACK-SIGHT.

error through canting the rifle. The medium "V," as shown, seems to be the one most in favour, and this is especially adapted for snap-shooting, such, for instance, as is often required in the jungle, whereby a ready bead can be aligned on the animal.

All said and done, in the matter of his rifle sights, a sportsman will be guided by personal requirements and the conditions of his shooting.

The peep or aperture sights of the Lyman type are well known amongst sportsmen. The peep sight is again a question of personal taste. In certain lights, when taking a slow shot, some consider it better than any form of "V," although the narrow "V" is especially adapted to deliberate aiming. But the aperture sight does not lend itself to accurate alignment when snap-shooting or in any case where a quick shot is needed. These peep sights are generally provided with the inner ring of the aperture fitted with a hinged piece which, on being moved down, gives place to a larger hole, so that the sportsman has the choice of two sizes of ring or aperture through which to aim. This sight is raised or lowered by turning a collar or the outer milled covering which carries the sight, as illustrated.

America for many years has been foremost in the production of this class of sight, mainly owing to the huge scale on which commercial conditions in that country permit these sights to be made. There rifle-shooting is a national pastime, and thus the question of turning out sights of one pattern in large quantities, and at cheap rates, has largely occupied attention.

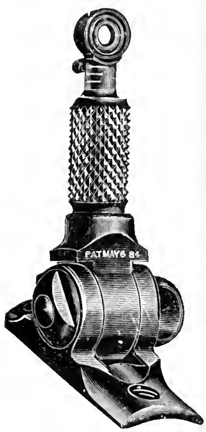


Fig. 124.—Lyman Peep Sight.

Fig. 125.—Westley Richards Peep Sight.

Of late, English makers have developed an interest in the manufacture of aperture sights, and one form now in use possesses points of merit superior to anything that the American manufacturers have as yet been able to produce. A novel and highly advantageous addition to the peep sight is the *wind-gauge appliance*, which causes the pillar and aperture to travel in a direct horizontal plane across the weapon.

This arrangement is doubly useful, for it corrects the natural deflection of the bullet due to lateral wind pressure, and it also assists to correct any inaccuracy in the shooting of a rifle due to wear, damage, or other cause.

The milled head screw which controls the cross movement is provided with a micrometer arrangement, slits being cut in the head, and into these a spring engages with an audible snick when the head is turned. The head may be so provided that the slits represent one minute or half-minute spaces; the latter representing on the target one inch at each 100 yards, that is to say, two

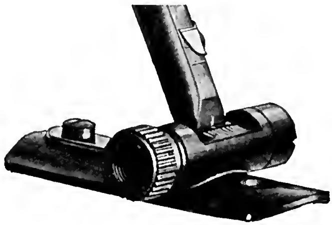


FIG. 126.—WIND-GAUGE APPLIANCE.

inches at 200 yards, and three inches at 300 yards, and so on. This fine adjustment, so easily manipulated, is a very great factor towards insuring accuracy in sport; it enables the shooter, say, at 100 yards, instantly and definitely to alter the position of his shot to the point aimed at, to the extent of one inch. This system of wind-gauge micrometer allowance is more fully described as applied to military sights alluded to further on.

FIG. 127.—LYMAN FORE-SIGHT.

FIG. 128.—BEECH FORE-SIGHTS.

In conjunction with these sights there are special pattern fore-sights of the Beech and Lyman well-known designs, as illustrated.

These fore-sights are preferred by some. They may also be used in conjunction with the open sights.

Before passing on to telescope sights, I will deal with military pattern (lift-up) sights.

Since about the year 1852, the military form of back-sight has been of the tangent or upright system; now, upon the new short-service weapon recently adopted, the pattern of sight has been changed and the flap-up back-sight, first employed upon continental rifles, has taken its place.

Westley Richards's tangent sight was capable of folding down either way. In 1854, the Government adopted a new back-sight combining the principles of both Mr. Westley Richards and Mr. Charles Lancaster, in conjunction with the Ordnance pattern sight fitted to the Minié rifle.

In the Westley Richards sight the flap can be put down on the barrel from or towards the muzzle. In the Lancaster sight the flap is protected by flanges, and in the Ordnance pattern adopted the flap is kept in a perpendicular position by a spring.

Fifty years ago we find that wind-gauge sights engaged the attention of rifle makers. I have seen several models of tangent sight made upon the wind-gauge principle by Westley Richards.

(1) The Westley Richards Wind-gauge Sight adopted fifty years ago. The tangent leaf moves across the bed by the action of a screw worked by a milled head or separate key carried in the pocket.

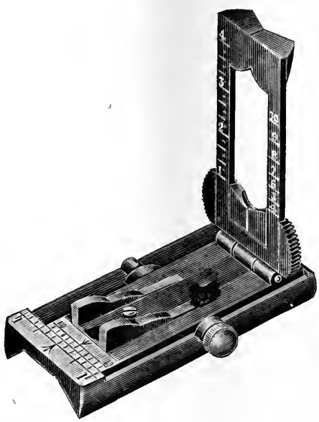


FIG. 129.—SIGHT UP.

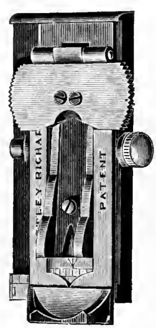


FIG. 130.—SIGHT DOWN.

The bed of the sight was dovetailed on to a bottom piece, across which the sight and its bed were moved by a screw arrangement working at the side. This was by no means an experiment, but a practical and efficient wind-gauge movement.

I have before me, as I write, a Westley Richards Capping Carbine, military pattern, No. 1158, made in the year 1862, in its original form, and it is fitted with the old wind-gauge back-sight described and illustrated. The fore-sight on this rifle is also made on the same mechanical principle for wind-gauge adjustment. I have also seen at Westley Richards's factory, amongst their relics, other examples of this wind-gauge sight.

Now that the interest in wind-gauge sights has been renewed and stimulated by recent events, this old system has been revived and "re-invented" as a novelty, although being nothing but a copy of the original.

(2) Tangent sight with wind-gauge slide, fifty years old. The slide or cap is worked by a screw across the tangent leaf. The milled head of "A," on the left side, moves the slide across. The one marked "B" is for tightening the slide in position against the side of leaf and prevents its disturbance under firing.

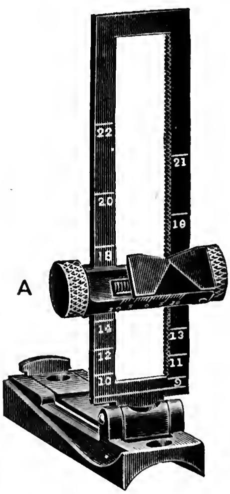


FIG. 131.—SIGHT UP.

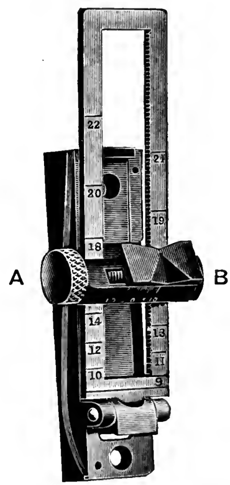


FIG. 132.—SIGHT DOWN.

(3) Match slide for M. B. L. rifles employed by eminent match rifle makers for thirty years or more. The cap or slide is moved

across the leaf by means of a screw. It is an application of the older mechanical device illustrated in Figs. 131 and 132; its form differing in unimportant details.

FIG. 133.—SIGHT UP.

Another method of effecting lateral adjustment, adopted by gunmakers on best sporting and military target rifles for Africa during the last half century, consisted in moving the bar in a dovetail across the slide of the tangent leaf, either with or without a screw arrangement. This well-known design, so long in general use, has also now been re-invented and introduced as a novelty, and even has received the favourable attention of the sporting press, whose archives evidently do not embrace the operations of the private gunmaker dealing with every branch of the gun and rifle trade and with interests scattered almost all over the globe.

Another device familiar to gunmakers, of which I have seen many old examples, is the screw arrangement for elevating the slide. This screw arrangement was fitted to the ordinary tangent sight, especially for use upon rifles adopted by the Boer marksman for target purposes. It is perhaps not so familiar to the shooting public of this country as it is in Africa, but the same design and principle were exhibited in the orthoptic match back-sight on target rifles made famous in the old Wimbledon days by Gibbs, Westley Richards and others, and is still in use on the match rifles of to-day. Nevertheless, only recently I have seen a sight having this old movement, which was represented as a novelty, and for which even patent protection was applied, although the idea and the design are as "old as the hills."

(4) Vernier Elevating Tangent Sight, as used by Boer marksmen for upwards of fifty years. The slide is moved up and down the tangent leaf by means of the screw.

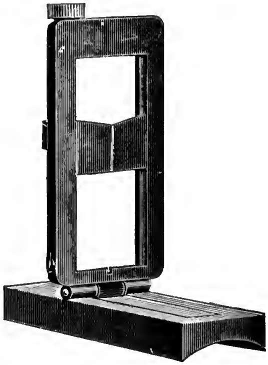


FIG. 134.—VIEW SHOWING THE ELEVATING SCREW AND VERNIER SCALE.

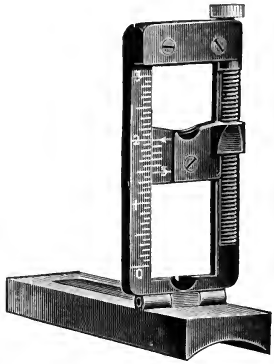


FIG. 135.—VIEW SHOWING SLIDE WITH "V" AND LINE.

(5) Vernier Elevating Tangent Sight combined with wind-gauge slide, as supplied by Westley Richards to the Boers, on rifles of a bygone pattern.

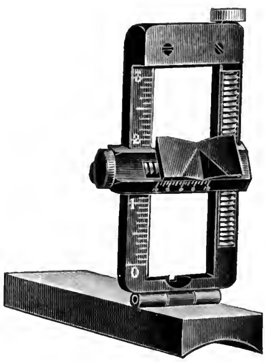


FIG. 136.

The first notable advance in the wind-gauge mechanical movement, fitted to the perpendicular tangent leaf, was introduced by Westley Richards & Co. in the year 1900. The early wind-gauge sight made by the late Mr. Westley Richards, as we have seen, moved the bed by carrying the leaf across a dovetail fitted upon the barrel. The later arrangement referred to introduces a new movement of carrying the leaf alone across its bed. Roswell Cook, an American inventor, had already attempted this arrangement. His sight is illustrated below.

(6) The Roswell Cook Tangent Sight, invented 1880. The tangent leaf works on a fixed screw across the bed. This, I believe, was the first attempt to move the tangent leaf separately across the bed. The spaces on either side of the tail-piece of tangent " A " are liable to get clogged—a serious objection.

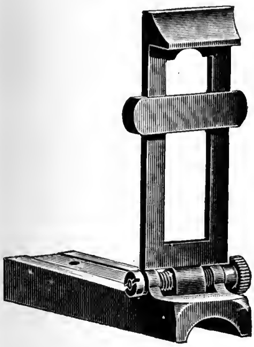


FIG. 137.—LEAF UP.

In the Westley Richards construction of sight, the tangent or leaf is attached to a round peg, which forms the pivot on which the sight leaf turns. This pivot or pin slides through shoulders formed on the sight bed, as shown in Figs. 138, 139 and 140. Fig. 139 shows the formation of the shoulders and the guide slopes for the self centring of the leaf, or its return to the normal position on being folded down, after having been set across for wind-gauge allowance.

When the tangent leaf is lowered, it bears against the guide slope K which automatically presses it towards the centre. This saves the trouble of pushing upon the pivot pin to carry the sight back from the wind-gauge position. This motion is also useful for making minute readjustments of wind-gauge allowance. Divisions are marked upon the back of the bed.

(7) The Westley Richards Push Pivot Wind-gauge Sight—arranged for automatic self centring of the tangent leaf.

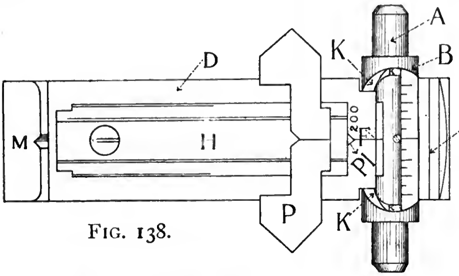


FIG. 138.

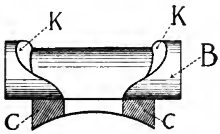


FIG. 139.

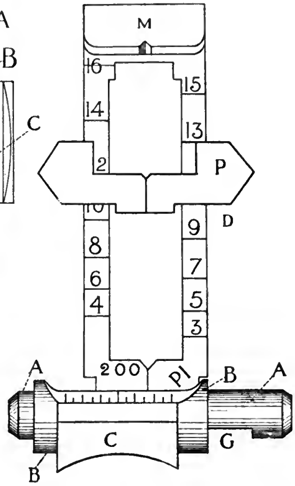


FIG. 140.

This makes a very strong and effective military sight. It is the pattern adopted on the Mark I Original Westley Richards Sherwood rifle.

In 1901 a further improvement was effected in this tangent sight. Messrs. Westley Richards & Co. gave thoughtful attention to the adjustment of elevation, which they desired to make capable of the same accurate movement as their former invention had provided for the wind-gauge or lateral movement.

(8) The Westley Richards Pivot Wind-gauge Sight, worked by traversing screw with vernier elevating slide, with spring catch or clutch.

For this purpose they laid under contribution the old elevating screw for moving the slide up and down the leaf, to which I have already alluded. The movements permitted by a screw thread are nicer and finer than any hand adjustment, but to rely solely upon this screw movement, and thereby to exclude the slide from any other method of movement, was to confine its use to a tedious and slow operation. Consequently the inventors constructed a special form of slide with a spring catch or clutch.

The screw clutch or catch referred to is shown in Fig. 145 applied to the flap-up new service sight. This clutch has formed upon it screw threads to correspond with the threads of the elevating screw, with which, when pressed upon by its spring, it is held in

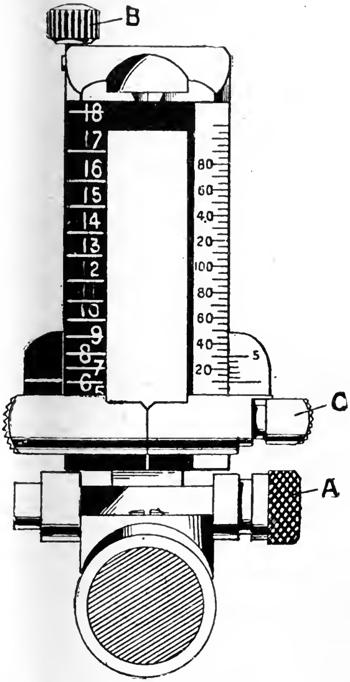
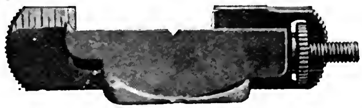


Fig. 141.—Pivot Wind-gauge Sight and Vernier Elevating Slide.

The slide is fitted with a patent screw clutch, and can either be moved up and down by means of the screw or independently; after fixing the slide to the line indicating the required range, subsequent adjustment of extreme fineness can be made by means of the elevating screw. The wind-gauge slide is moved across the leaf by a screw. The screw-head has Westley Richards micrometer arrangement—a spring snicking into notches formed in the screw-head. This is an adaptation to a Lee-Metford or Lee-Enfield Service Leaf.

close engagement, and thus prevents any movement of the slide through jar upon firing, and, when desired, can be moved by the turning of the elevating screw. By this means, on pressing upon the ends of the slide with the thumb and finger, the clutch or catch is released from engagement with the screw, and the slide can then be moved up and down the tangent leaf by hand in the usual way. Thus we have provided in this arrangement both a means of ready elevation, and also of fine vernier adjustment. A shooter having obtained the position of, say, 500 yards upon the leaf, and wishing to correct his elevation to the fine point of a few inches up or down, can readily effect this nice adjustment by



For attachment to the Government Service Lee-Enfield and Lee-Metford Leaf.

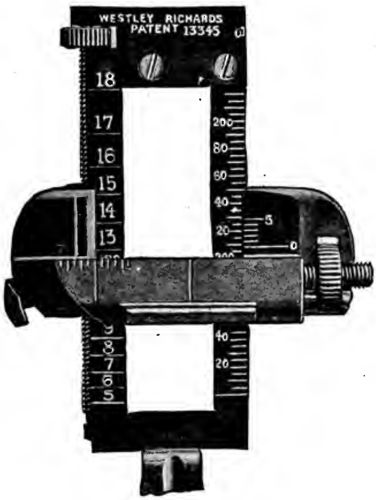
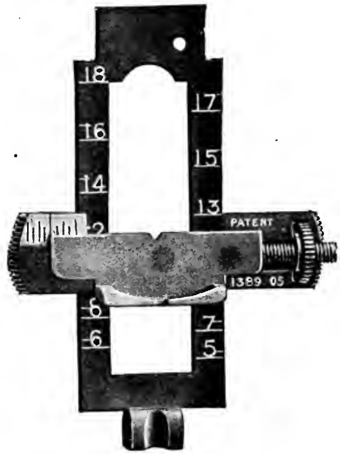


FIG. 142.—WIND-GAUGE BAR WORKED BY TRAVERSING SCREW, WITH VERNIER ELEVATING SCREW AND SCREW CLUTCH FITTED TO SERVICE LEAF.



Attached to Service Leaf.

FIG. 143.—WESTLEY RICHARDS WIND-GAUGE MICROMETER SLIDE.

turning the screw, which in the past would require the attachment of a separate vernier, which is slow to adjust, and has to be carried separately in the pocket. Thus, in one and the same sight, we now have a perfect wind-gauge movement as well as a vernier elevating screw without any disadvantage.

This is the pattern adopted on the Sherwood Rifle Mark II. There is a further advantage possessed by this sight which is especially serviceable in target shooting. The milled head is constructed with a micrometer arrangement, which affords a ready means for computing the amount of wind-gauge allowance taken. The traversing pin is cut with a screw of a suitable number of threads to the inch, and the head of the pin is

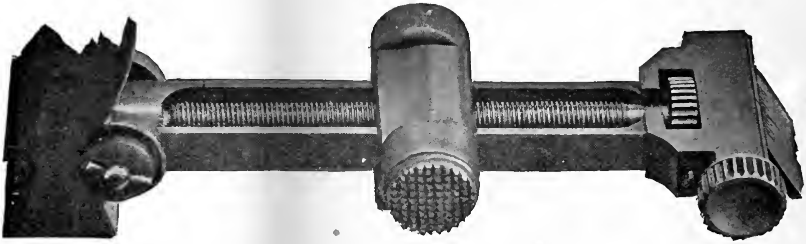


FIG. 144.—UNDER-SIDE OF THE LEAF, WITH WESTLEY RICHARDS VERNIER ELEVATOR SCREW.

divided into notches of either four or six at equal distances. A spring fitted underneath snicks into or engages with each notch as the milled head is turned, thus at each quarter turn or a turn of

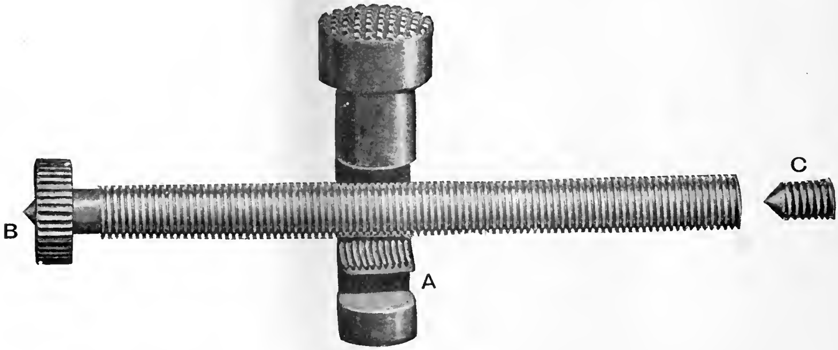


FIG. 145.—THE WESTLEY RICHARDS ELEVATOR SCREW AND SPRING CLUTCH, SCREWED AT A. B AND C ARE THE POINTS UPON WHICH THE SCREW REVOLVES, C ALSO ACTING AS AN ADJUSTING PIN.

one-sixth of the screw, a movement of a fractional part of an inch is obtained and indicated, representing a definite value in inches of wind-gauge allowance upon the target or object at every unit of range. Four divisions to the complete turn represent each about 1 inch for each 100 yards.

The shooter by this means not only obtains minute corrections of wind-gauge allowance, but the exact amount registered is conveyed to his ear and to his touch without calling upon him to read off the wind-gauge scale. This is illustrated in Fig. 149 referring to the flap-up pattern of sight of the kind fitted upon the new short-service rifle recently introduced.

On the flap-up sight now adopted on the short-service rifle there

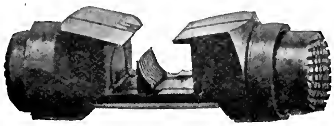


FIG. 146.—SEPARATE VIEW OF COMPLETE SLIDE AND SPRING CLUTCH.

is a wind-gauge or lateral movement of the "V," and thus for the first time upon our service rifle the need for a wind-gauge sight so long advocated by rifle experts is recognized by military authorities. There is nothing novel in the system employed for moving the "V" laterally in the service sight now under discussion. It is, in short, the old and well-known screw arrangement adopted in the

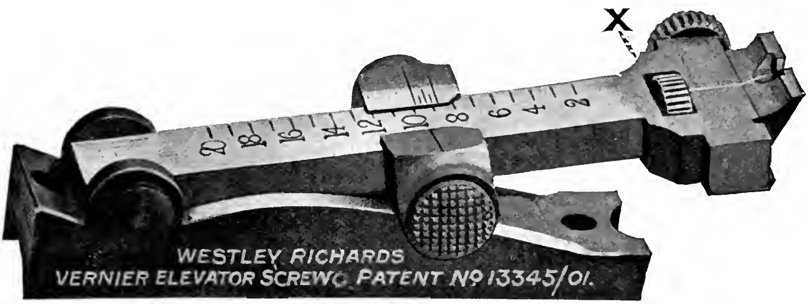


FIG. 147.—THIS FORM HAS THE GOVERNMENT HEAD AND WIND-GAUGE.

past, as we have seen, to move the bar across the slide upon the tangent leaf. It is also a common arrangement in the construction of wind-gauge fore-sights of half-a-century back. The leaf or flap is provided at each side with deep grooves : each division of the ratchet or groove gives a 50 yards rise, and the spring catch elevating slide engages in these grooves. For fine elevation the head of the sight upon which the "V" is attached is made in two parts—one dovetailing into the other, and a screw underneath raises or lowers the movable part to which the "V" is attached for this fine adjustment.

This method of obtaining vernier adjustment is unmechanical and difficult to manipulate, as the sight flap has first to be raised before the screw underneath can be operated.

There are further objections to this service sight. The vernier scale and the scale for elevation are not on the same plane, and this makes it necessary for the shooter to turn his weapon round when desiring to read the fine adjustment scale. This sight is complicated, consisting of nineteen parts.

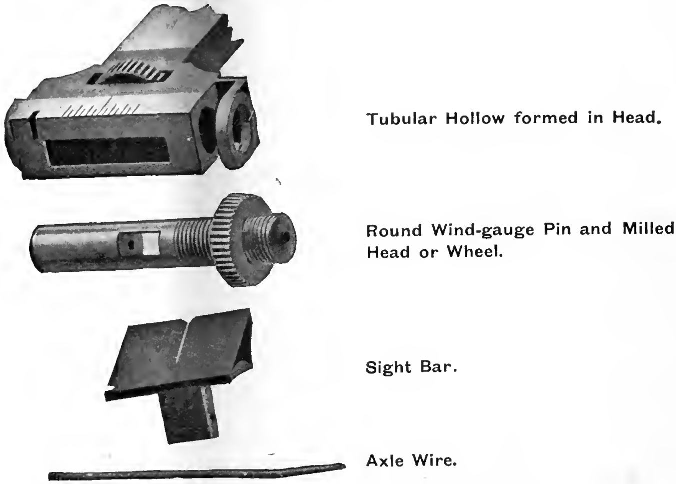


Fig. 148.—Sight Head, showing Westley Richards Patent Wind-gauge and Component Parts.

Messrs. Westley Richards have applied the improvements which I have mentioned as touching the tangent sight, and have also added others of recent invention to this form of flap-up sight. In their new model the grooves at the side of the leaf are omitted, and instead, a screw fixed within the leaf on the under-side engages with a spring clutch of the kind already described, as used upon the ordinary tangent sight (Fig. 147). This gives, in addition to the ordinary method of obtaining elevation, an easy method of minute corrections, the sight being in one combination a vernier and elevating sight, dispensing with the pocket vernier, the same as in the tangent sight constructed on a similar mechanical principle.

The illustrations show that the milled head of the screw fitted within the leaf (as seen in Figs. 144 and 147) projects through the upper surface of the leaf or flap, and can be worked by the thumb with ease.

In place of the antiquated wind-gauge screw arrangement on the Government flap-up sight, Westley Richards move the head or "V" notch in the following way. The "V" notch is attached to a round

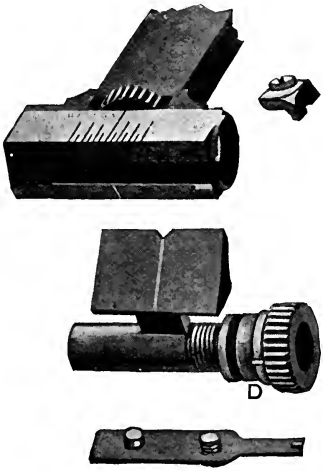


Fig. 149.—Sight Head, showing alternative method of constructing Westley Richards Patent Wind-gauge, with or without Ratchet.

This method of construction illustrated is the same in principle as the micrometer arrangement described in conjunction with the tangent form of sight.

pin, which traverses a tube or hollow formed in the head of the flap; this pin is screwed, as shown above, and is worked by a milled head or wheel fixed at the right-hand side of the sights (Fig. 148).

The vernier scale and the scale for elevation in this improved sight are upon the same plane, which obviates the difficulty of having to turn the rifle round to read the vernier scale. The sight consists complete of ten pieces, as compared with nineteen in the service sight; it is easier to make and manipulate, and more efficient and mechanical than the short service sight. The ten parts are as follows—

(1) Back-sight Leaf.
(2) ,, Slide.
(3) ,, Slide Screw Clutch.
(4) ,, Slide Clutch Spring.
(5) ,, Slide Elevating Screw.
(6) ,, Slide Elevating Screw Adjusting Pin.
(7) ,, Wind-gauge.
(8) ,, Wind-gauge Screw Head.
(9) ,, Wind-gauge Axle.
(10) ,, Wind-gauge Axle Pin or Wire.

When made with the micrometer divisions on the screw, to give definite and minute fractional parts of wind-gauge allowance, the number of parts are increased to thirteen. This latter form of sight is more especially recommended for sporting weapons or for fine match target shooting, as opposed to military purposes.

This sight, made in reduced proportions, would, I think, make an ideal sight for single and double and sporting rifles, because the method of elevating the slide is of the finest description and easily effected. The sportsman can get what he never had before, namely, fractional adjustment to a yard, or less, if necessary. In short, he is not tied down to the rigid control of sights fixed to one elevation, and can himself arrange a basis of elevation to suit the special needs both of the sport in his district and his personal requirements. For instance, he can elevate his rifle sight from 90 yards to 100 yards, or from 100 yards to 110 yards, etc. At the same time he is always sighting through one and the same rear sight and "V," the shape and height of which are not altered. The rise in the flap of this pattern sight to 300 yards or more is insensible; and for larger ranges up to 1000 yards is not objectionable.

The wind-gauge movement is not always necessary, but even in short-range shooting, down ravines for instance, it would prove of advantage, and will, I think, be welcomed for long-range shooting in Africa and elsewhere. Moreover, the wind-gauge is there for the correction of errors, whether personal, or due to wear or injury to the rifle or other outside conditions.

Telescope Sights.

Telescope sights now have a recognized place in sport For the last twenty years or more fitful attempts have been made to overcome all the inherent difficulties with regard to the attachment and durability of telescope sights as applied to rifles. At first opticians had not given close attention to the construction of a telescope especially adapted to sporting rifle work. An ordinary tube with suitable magnifying glasses was thought to suffice; with this the field of view was narrow, whilst the instrument proved ungainly, and was unprovided with any means for ready attachment and detachment. The use of these instruments was mainly confined to miniature rifles or rook rifles, but, in effect, these crude magnifying glasses were not found to be superior to the ordinary methods of sighting; moreover, the users of telescope sights are always confronted with the difficulty that every hostile condition is exaggerated four or five fold. In a bad light the difficult features interfering with good aim are intensified, a murky atmosphere is still more murky, and unsteadiness of holding is increasingly apparent.

When these sights are applied to heavy sporting rifles, or in any rifle where there is considerable jar from the explosion, the cross wires or hair lines, which form the means of sighting upon the object, are liable to break under the sudden shock. American manufacturers have long given attention to the question of telescope sights, but they are mostly applied to small bore miniature rifles, although a goodly number are used on hunting weapons; the latter, however, are not such powerful weapons as the old heavy, black powder rifles, or the modern high velocity series now in such general use for game shooting throughout the world.

To continental makers we owe considerable improvement in that class of telescope suitable for sport on high-velocity weapons, single and double; notably to Carl Zeiss, of Jena.

Telescope sights may be employed for different purposes. They may be required merely to counteract defective vision, or to increase the normal vision, and, therefore, the sportsman's chance of success at long distances. Or they may be used both for the purposes of a sight and a telescope. It is admitted that a rifle cannot be held still when shooting from the shoulder without any rest for the rifle. The magnifying power of the telescope multiplies the movements on the part of the shooter and renders sighting under such conditions the more difficult with some and impossible with others. It is for this reason that a low power telescope for shooting purposes is preferable to a high power, but the telescope also—like any other form of sighting—must be constructed to meet the vision and the personal needs of the shooter.

Fig. 150.—Zeiss Telescope Sight with Westley Richards Attachment.

The Zeiss telescope alluded to has every recommendation as a sporting telescope sight. It has a field of view nearly three times as large as that in the best types hitherto used. At 100 yards the diameter of the field of view is $23\frac{1}{2}$ yards, which is approximately a quarter of the distance. The magnifying power is two and a half, thus facilitating aim without, at the same time, producing that multiplied movement or swaying of the image referred to, which sportsmen more or less experience when shooting without a rest.

It is a prism telescope, with which it is claimed that, besides the large field of vision, distinctness and brightness of the image up to the margin are obtained. The maker claims that the brightness is greater than any other known prism telescope.

Messrs. Holland, and Rigby, and other well-known gunmakers, have given attention to telescope sights, and now make very successful ones. The difficulty of elevation to give different distances of the sight was tackled some years ago by Messrs. Holland, who made a satisfactory sight arrangement.

Westley Richards also had a similar system, which consisted in an external radial screw which moved the sight lines up

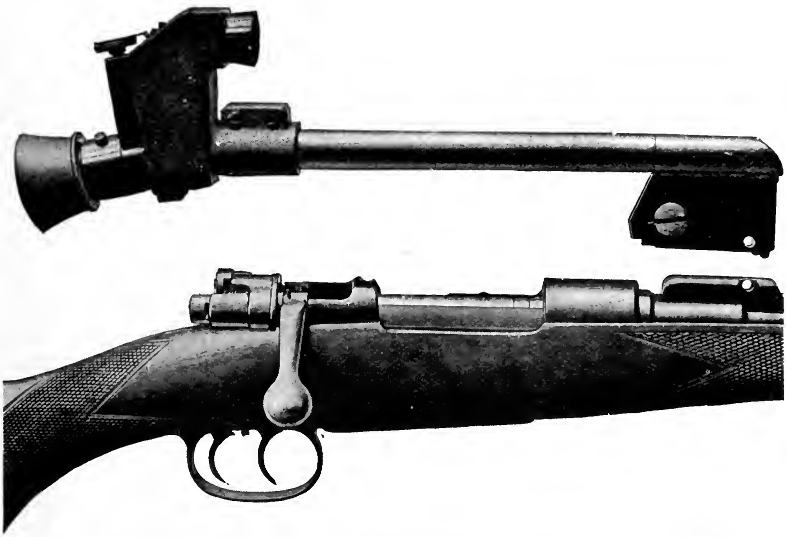


FIG. 151.—WESTLEY RICHARDS TELESCOPIC RIFLE SIGHT ATTACHMENT. SHOWING TELESCOPE DETACHED.

and down, the value of the divisions for each rise or fall being marked on the top of the screw. In the Zeiss sight, the elevation is obtained by means of a similar screw, which is capable of adjusting the elevation from zero to 2000 yards. Some makers use these sights with different attachments. They are usually attached rigidly to the rifle, but the rigid attachment is liable to break the glasses, and this has been a serious cause of trouble.

Again, I have seen telescope sights with these fixed or rigid attachments which, after some little use, become loose. If the rigid attachment held, the chances are that the wires or other parts would give way under the vibration of the explosion. The only way of meeting this difficulty is to provide the telescope with a movement under firing which will absorb the jar or vibration. The arrangement in Fig. 150 meets this objection by pivoting the telescope, and I describe their method below, and illustrate the attachment both for double and single rifles, Mauser rifles, and also for the Sherwood rifle.

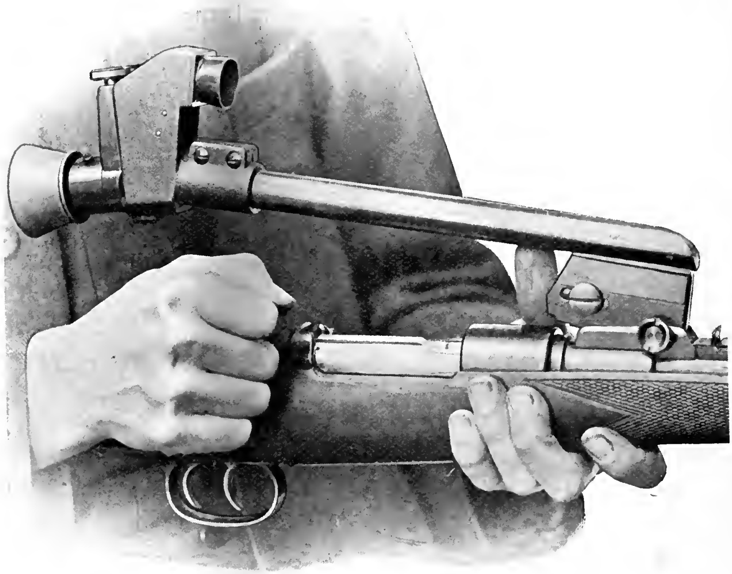


Fig. 152.—Westley Richards Telescopic Rifle Sight Attachment.

This method of attachment, besides obviating the trouble caused by the constant jar of recoil, permits of the instant removal of the telescope by hand, without the aid of tools. I consider it to be a further advantage that the telescope sight can readily be detached for the purpose of carrying it in a separate case, and so protected from damage when travelling. Again, when it is desired to shoot with open sights, a free and unobstructed view is best obtained by the absence of the telescope.

A bed or platform, to which the telescope sight is pivoted, is placed in front of the ordinary sight. A plunger controlled by a spiral spring is fitted within the block attached underneath the tube, which tends to keep the telescope in its position on the bed. This pivoting of the telescope permits its being raised in a ready manner, as shown in Fig. 152. This sketch shows the sportsman lifting up the telescope with the thumb of left hand, in order to clear it out of the way of the bolt while the right hand is manipulating the bolt to cock and load the weapon, and is the simplest means yet devised for satisfactory use of the telescope sight upon magazine bolt rifles. When the weapon is discharged, the

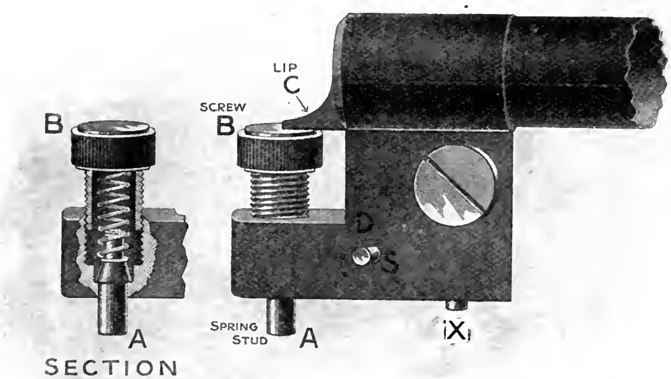


FIG. 153.—WESTLEY RICHARDS PATENT TELESCOPE SIGHT ATTACHMENT FOR SINGLE AND DOUBLE RIFLES.

freedom of movement thus allowed to the telescope absorbs the jar or vibration set up by the explosion, and so avoids straining or breaking the delicate wires or otherwise dislocating the sight—a frequent source of trouble in those types of fixed fastenings which are supposed to keep the sight rigid. In practice it is found that these so-called rigid fastenings give way under the shock of the explosion, and so destroy the accurate adjustment.

The bright pin underneath the block, if turned outwards, elevates the zero, that is, raises the elevation. A half-turn is equal to about 100 yards of elevation. The right and left pins move the dovetail either way to correct horizontal adjustment. A fine line is shown on front of block, and a movement either way to the extent only of the thickness of the line equals a deviation of about eight to ten inches in 100 yards, according to the length of the telescope tube.

The slit in the attaching pin is broad enough to take a copper coin.

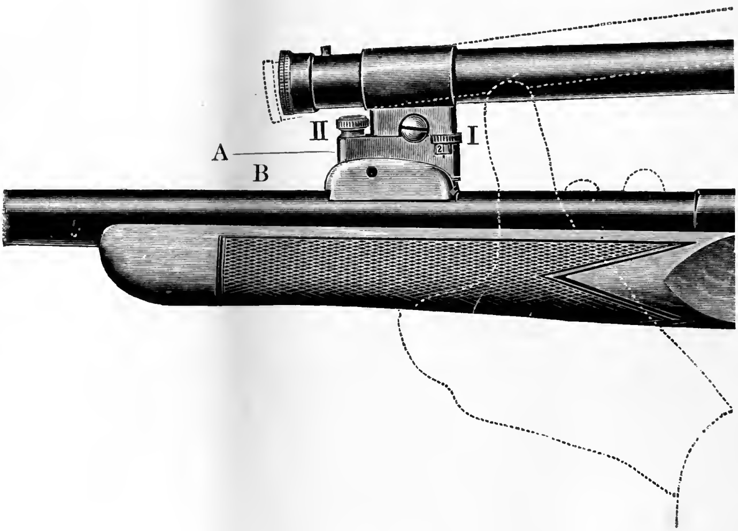


Fig. 154.—Westley Richards Sherwood Rifle Telescope, with Patent Hinged Attachment and Micrometer Sight Elevator.

The stud S at either side of the telescope block fits into the slots provided at either side of the bed on the barrels, and allows the telescope to pivot. The spring stud A holds the telescope in position. The screw B alters, when turned, the pressure of the spring which controls the stud A. When turned up under the lip C, as shown above, the tension is taken off the spring, and allows the spring stud A to be easily compressed, and the telescope withdrawn from the bed. When the screw B is turned down, it puts tension upon the spring of spring stud A, which serves to keep the telescope in the normal position when the telescope is attached. To give the proper tension to the said spring, you turn down the screw B half-way between the points C and D. To detach telescope, therefore, turn screw up till the head reaches point C. Press on end of telescope gently and firmly, which will compress the spring stud A, and then slide telescope out of the bed. It draws away most easily. To attach it, slide it along the bed until the spring stud A snicks into position, and screw down the screw B as stated, to give the proper tension.

The elevating set pin X should not be interfered with; it is the pin used by the makers in sighting the telescope. Each telescope is sighted from 100 yards, and is sent out with the set pin X in the correct position for this distance. If, for any possible reason, the 100 yards' elevation should not be found correct, then, by turning the pin X slightly, it can be correctly adjusted. A half-turn of this pin gives a difference of a little over 100 yards.

The above sketch shows the Westley Richards Sherwood rifle fitted with tube telescope sight, in addition to the ordinary sights, with their patent attachment. The telescope can be attached or removed instantly, and without the aid of tools.

It has a magnifying power of four, which is the size they recommend on the above pattern telescope, enlarging the bull four times the size it appears to the naked eye at all ranges.

The method of attachment, described briefly, is this: a steel lug is fixed on the forward end of the telescope lengthwise as at A. Through the front lower end of this lump, a piece of wire is run, which protrudes at each side. This forms the axle or pivot on which the telescope lifts up and down, and practically completes the joint. A bed is fixed on the barrel of the rifle at the breech end B, in the middle of which a slot is machined to receive the lug A, with grooves on either side, along which the axle or pivot is pushed. These two grooves turn up a short distance at the end, allowing the axle to bed nicely in these upward grooves; a plunger controlled by a spiral spring, fitted at the end of the bed, keeps the telescope in its downward position. By turning the milled head screw II, the tension is taken off the spring, and the pivot or axle can be pushed back along the grooves already described, thus enabling the telescope to be fitted on the rifle and removed again in less time than it takes to tell. The screw I controls the elevation.

Trajectory.

Trajectory is the arc or curved line described by a projectile in its flight from the muzzle of the gun to the point of its impact. The adjectives flat and high and low, as applied to trajectory and to velocities, must be accepted in a general sense, otherwise they are liable to be misconstrued. Strictly speaking, the term *flat* trajectory is a misnomer, for one cannot well describe a curve as "flat." Flattened, or flattish, trajectory might answer, but a flat curve one never yet did see. A high trajectory results from a low projectile velocity; a low trajectory from a high bullet velocity. This curved aërial path of the bullet may be described as the arc; the line of vision, from shooter's eye to objective, forms the chord to that segment.

Elevation of the muzzle of the firearm is essential as counteracting the effect of gravity upon the projectile; consequently the greater the elevation the greater the trajectory curve.

In the days of black powder, with spherical bullets, and the loose methods of rifling the barrel then practised, trajectories were so exceedingly high that it was necessary to point the rifle skywards in order to hit an object distant but a few hundred yards. The process of reducing this high trajectory has been steadily progressing for a number of years. First, an improvement in the rifling of barrels; second, the change from spherical to cylindro-conoidal projectiles; and, third, the improvement in gunpowders, effected marked advances in this direction.

Modern gunmakers with improved systems of rifling, and modern powder manufacturers with one or another form of smokeless powder, have still further reduced bullet trajectories. In fact so low is now the trajectory with the latest type of modern high velocity rifles that a slight variation in the exposure or elevation of the bead fore-sight through the notch of the 100 yards back-sight, which can be readily and accurately effected, will insure hitting an object at all ranges from 100 yards to 300 yards.

The question of trajectories given by the various military rifles in use has been dealt with by authorities in the past, who have endeavoured to make plain to the ordinary reader the value of the somewhat abstruse tables they presented. Such figures, however, do not appeal to the average sportsman who is not acquainted with, and cares little for, mathematical calculations in connection with gunnery. Perhaps there is only a very small proportion of shooters who really quite understand what is meant by them or how they are arrived at.

Therefore it has always seemed to me desirable, in the interests of the every-day sportsman, to frame a table of trajectories especially applicable to sporting distances, and to express in plain figures gathered from actual tests, the height of any bullet above or below the line of aim taken, instead of relying upon the results calculated mathematically.

This latter method has been generally adopted in the past, and has therefore failed to clearly present to the sportsman's mind the true effect resulting from error in judging distances.

I think it will be generally conceded that average sporting distances do not extend beyond 300 yards. As a matter of fact, much game is shot at ranges not exceeding 150 yards. To this general statement, of course, we have the exceptional long range shooting which characterizes a great deal of the South African sport, where small buck and kindred game are shot on the veldt at ranges of several hundred yards.

But taking that class of sport which necessitates the use of a rifle sighted to 300 yards as a fair sporting range, such as obtains in India, it has been sought to ascertain what is the value of the error in shooting a weapon so sighted with any one of its three sights at any probable range between its first and third sights. For instance, in the case of a sportsman having a rifle sighted to 300 yards, and treating that range as the maximum, we require first to ascertain what would be the result of a shot fired at 300 yards with the 100 yards sight; secondly, the result, using the 100 yards sight at a range of 200 yards, and also the result with the 300 yards sight at either 100 or 200 yards. That is ascertaining the position the bullet would occupy on the object aimed at under the aforementioned conditions. If the sportsman knows this, and he can know it from data ascertained by actual experience, and moreover, if such data is expressed in inches, then in the case of error in taking either a low sight or a high sight, he knows the corresponding rise of the bullet above or the fall of the bullet below, the mark aimed at. He will thus possess such a thorough knowledge of the behaviour of his rifle that, in the conditions we have assumed, he will be able to definitely correct the fault either way by a corresponding adjustment of his aim.

This adjustment of aim will be all the more accurate from the fact that the sportsman is in possession of a table which gives, with almost absolute exactitude, the result in inches of the bullet's position with regard to the point of aim, thereby permitting him to make the correction, not by mere guess work as in the past, but by knowledge which permits of a more or less definite allowance.

I have prepared trajectory tables ascertained from actual shooting by means of interposing screens, so as to see the exact position of the bullet; measuring the rise of the bullet above the line, or the fall below the line of sight, in most kinds of sporting rifles now in use, when shot at distances supposed to be ill estimated to various extents.

I believe that this is the first time any practical attempt has been made on these lines. It will be seen that the figures in the tables apply to every bore of sporting rifle, from ·256- to ·600-bore.

In the old days, when black powder rifles were in use, their trajectories were higher. With express rifles of ·450- and ·500-bore the rise of the bullet at 50 yards, when shooting at 100 yards, was more than that of nitro express rifles of the same bores fired with 100 yards sights at twice the distance.

The accompanying series of trajectory tests, by firing through screens, have been carried out at Westley Richards's range at Bournbrook, and have been verified from time to time. The diagrams in each case show the following—

(*a*) The distance of target from shooter—*i. e.* firing point.
(*b*) The respective distances from the firing point at which the paper screens were placed.
(*c*) Result, indicating the point at which the bullet passed through the screens, and showing the amount of bullet rise or trajectory height above the line of sight at each distance when shooting at the ranges given.

For example, with the Mannlicher ·256 rifle we see that with the target 200 yards distant from the shooter the screen was placed 100 yards away. This diagram shows that the bullet under these conditions rises $4\frac{1}{2}$ inches above the line of sight. Again, with this rifle with the target 300 yards distant, paper screens were placed at 100 yards and 150 yards from the shooter. The diagram illustrates that at this range the bullet rises $9\frac{1}{4}$ inches above the line of sight through the 100 yards' screen, and 11 inches above the line of sight through the 150 yards' screen. The exact rise in accordance with the above description is ascertainable in each case from the diagrams given.

I.—Mannlicher, ·256-bore.

Barrels, 26 inches; cordite powder, 31 grs.; bullet, 160 grs. muzzle velocity, 2395 feet per second.

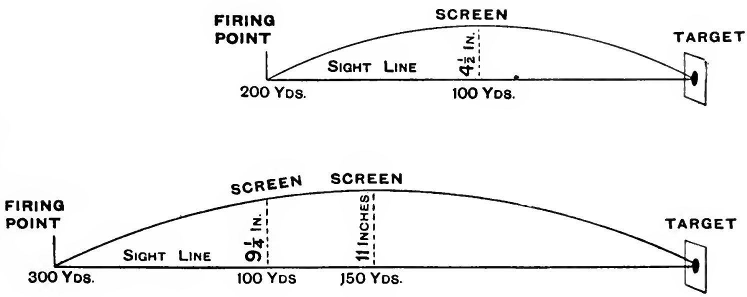


Fig. 155.—Trajectory.

Shot at	100	yds. with	200	yds. sighting,	bullets	go	$4\frac{1}{2}$	inches	high.
,,	100	,,	,,	300	,,	,,	,,	$9\frac{1}{4}$	,,	,,
,,	200	,,	,,	300	,,	,,	,,	10	,,	,,
,,	200	,,	,,	100	,,	,,	,,	10	,,	low.
,,	300	,,	,,	200	,,	,,	,,	15	,,	,,
,,	300	,,	,,	100	,,	,,	,,	$28\frac{1}{2}$	,,	,,

2.—A ·303-BORE WESTLEY RICHARDS DOUBLE RIFLE.

Barrels, 26 inches; cordite powder, 31 grs.; bullet, 215 grs.; muzzle velocity, 2000 feet per second.

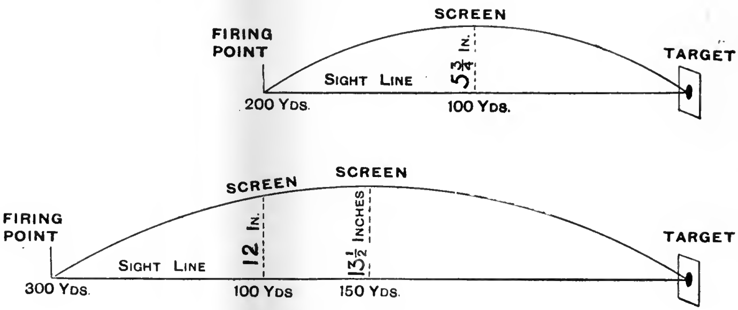


FIG. 156.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	$5\frac{3}{4}$	inches	high.
,,	100	,,	,,	300	,,	,,	,,	,,	12	,,	,,
,,	200	,,	,,	300	,,	,,	,,	,,	13	,,	,,
,,	200	,,	,,	100	,,	,,	,,	,,	12	,,	low.
,,	300	,,	,,	200	,,	,,	,,	,,	17	,,	,,
,,	300	,,	,,	100	,,	,,	,,	,,	34	,,	,,

3.—A ·360-BORE WESTLEY RICHARDS UNDER-LEVER RIFLE.

Barrels, 26 inches; cordite powder, 30 grs.; bullet, 300 grs.; muzzle velocity, 1650 feet per second.

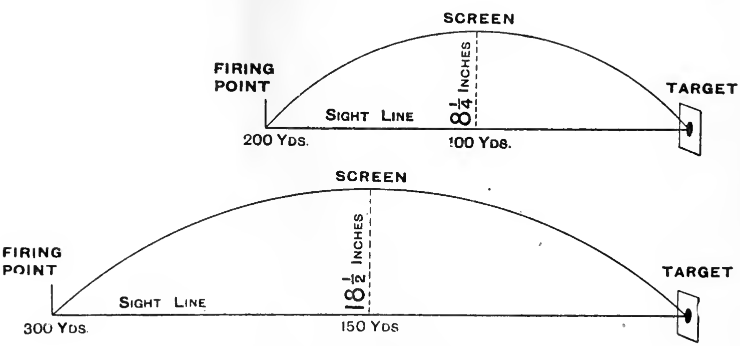


FIG. 157.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	$8\frac{1}{4}$	inches	high.
,,	100	,,	,,	300	,,	,,	,,	,,	17	,,	,,
,,	200	,,	,,	300	,,	,,	,,	,,	17	,,	,,
,,	300	,,	,,	200	,,	,,	,,	,,	$26\frac{1}{2}$	,,	low.

This is a medium powder rifle, and should not be included in this series; but its performances in point of trajectory may prove of interest.

4.—A ·375-bore Mannlicher-Action Rifle.

Barrel, 26 inches; cordite powder, 40 grs.; bullet, 270 grs.; muzzle velocity, 2000 feet per second.

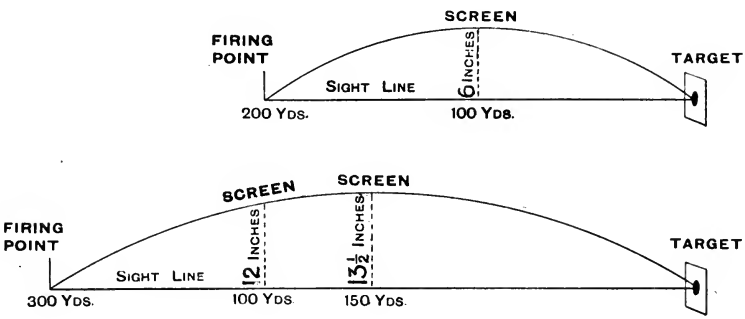


Fig. 158.—Trajectory.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	6	inches	high.
,,	100	,,	,,	300	,,	,,	,,	,,	12	,,	,,
,,	200	,,	,,	300	,,	,,	,,	,,	12	,,	,,
,,	300	,,	,,	200	,,	,,	,,	,,	17	,,	low.
,,	300	,,	,,	100	,,	,,	,,	,,	$34\frac{1}{2}$	,,	,,

5.—A ·400/·360 Westley Richards Under-lever Action Rifle.

Barrel, 27 inches; cordite powder, 41 grs.; bullet, 314 grs.; muzzle velocity, 1875 feet per second.

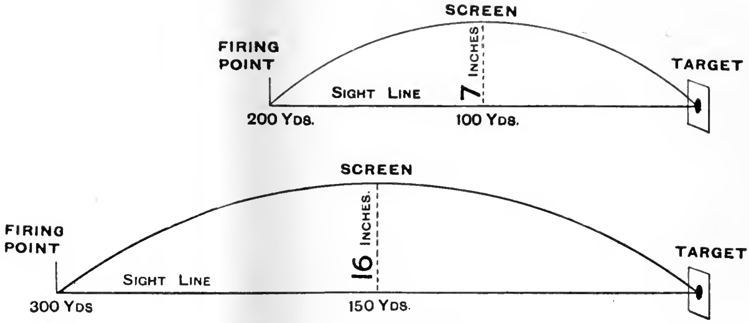


FIG. 159.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	7	inches	high.
"	100	"	"	300	"	"	"	"	14	"	"
"	200	"	"	300	"	"	"	"	14	"	"
"	200	"	"	100	"	"	"	"	14	"	low.
"	300	"	"	200	"	"	"	"	20	"	"
"	300	"	"	100	"	"	"	"	37	"	"

6.—A ·450/·400 WESTLEY RICHARDS UNDER-LEVER ACTION RIFLE.

Barrel, 26 inches; cordite powder, 60 grs.; bullet, 400 grs.; muzzle velocity, 2150 feet per second.

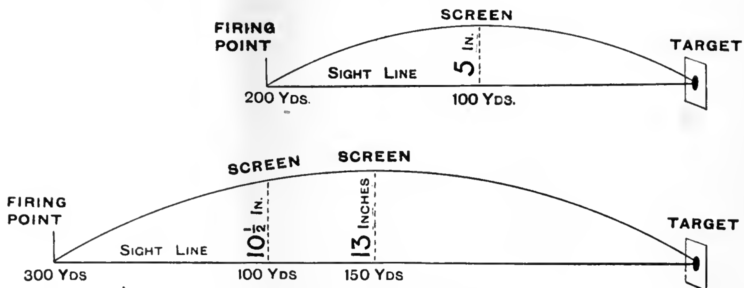


FIG. 160.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	5	inches	high.
"	100	"	"	300	"	"	"	"	10½	"	"
"	200	"	"	300	"	"	"	"	11	"	"
"	200	"	"	100	"	"	"	"	10½	"	low.
"	300	"	"	200	"	"	"	"	16	"	"
"	300	"	"	100	"	"	"	"	32	"	"

7.—A ·450-bore Rifle.

Cordite, 70 grs.; bullet, 480 grs.; muzzle velocity, 2150 feet per second.

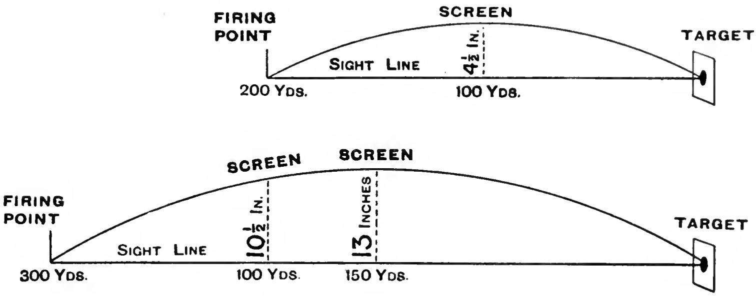


FIG. 161.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	$4\frac{1}{2}$	inches	high.
"	100	"	"	300	"	"	"	"	$10\frac{1}{2}$	"	"
"	200	"	"	300	"	"	"	"	11	"	"
"	200	"	"	100	"	"	"	"	$10\frac{1}{2}$	"	low.
"	300	"	"	200	"	"	"	"	$16\frac{1}{2}$	"	"
"	300	"	"	100	"	"	"	"	32	"	"

8.—A ·500-bore Westley Richards Under-lever Action Rifle.

Barrel, 26 inches; cordite, powder 80 grs.; bullet, 570 grs.; muzzle velocity, 2100 feet per second.

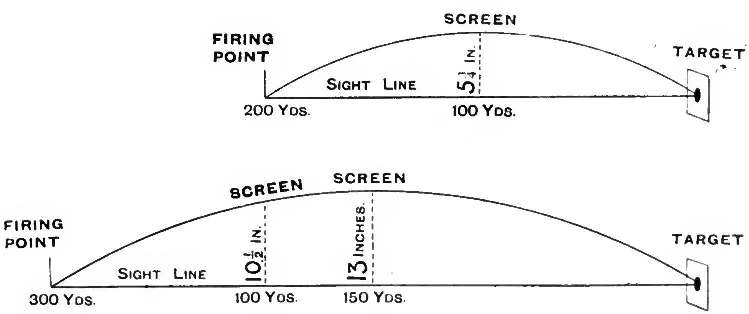


FIG. 162.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	$5\frac{1}{4}$	inches	high.
”	100	”	”	300	”	”	”	”	$10\frac{1}{2}$	”	”
”	200	”	”	300	”	”	”	”	11	”	”
”	200	”	”	100	”	”	”	”	11	”	low.
”	300	”	”	200	”	”	”	”	17	”	”
”	300	”	”	100	”	”	”	”	33	”	”

9.—A ·577-Bore Westley Richards Double Rifle.

Barrels, 26 inches; cordite powder, 100 grs.; bullet, 750 grs.; muzzle velocity, 2050 feet per second.

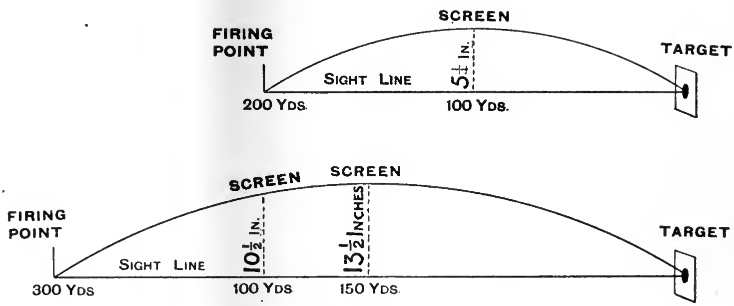


Fig. 163.—Trajectory.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	$5\frac{1}{4}$	inches	high.
”	100	”	”	300	”	”	”	”	$10\frac{1}{2}$	”	”
”	200	”	”	300	”	”	”	”	$10\frac{1}{2}$	”	”
”	200	”	”	100	”	”	”	”	$11\frac{1}{2}$	”	low.
”	300	”	”	200	”	”	”	”	16	”	”
”	300	”	”	100	”	”	”	”	33	”	”

10.—A ·600-bore Westley Richards Double Rifle.

Barrels, 26 inches; cordite powder, 100 grs.; bullet, 900 grs.; muzzle velocity, 1880 feet per second.

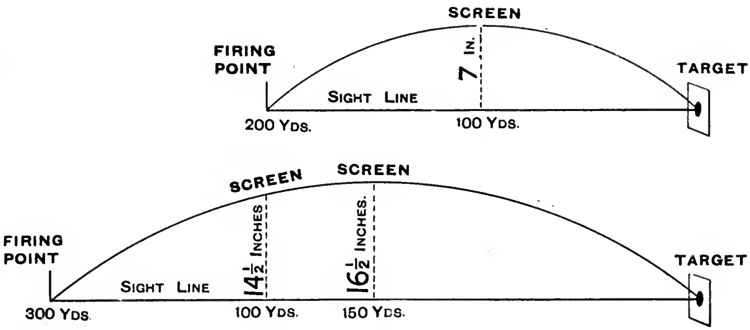


FIG. 164.—TRAJECTORY.

Shot at	100	yds.	with	200	yds.	sighting,	bullets	go	7	inches	high.
„	100	„	„	300	„	„	„	„	14½	„	„
„	200	„	„	300	„	„	„	„	14½	„	„
„	200	„	„	100	„	„	„	„	14½	„	low.
„	300	„	„	200	„	„	„	„	20	„	„
„	300	„	„	100	„	„	„	„	37	„	„

These rifles were shot with open sights and with Kynoch cartridges, and also capped bullets, except ·256, ·600, ·360 and ·375-bores.

It may be explained that any bore of rifle with a velocity of 2000 feet can be so constructed with one standard back-sight with a suitable depth of "V" and a corresponding height of bead fore-sight, which permit either more or less of the bead to be readily drawn upon the object. By this arrangement the shooter is in the position of being able to place the shots accurately on the object with one and the same fixed standard sight at distances of from 100 to 300 yards, merely by varying the amount of fore-sight taken through the "V." With such a rifle, assuming that the radius of the back- and fore-sights is 18 inches, the fore-sight bead should measure in diameter $\frac{5}{100}$ of an inch, equal ·05 inch. Its height should be from $\frac{4}{100}$ to $\frac{5}{100}$ of an inch above its stem, and the "V" in the back-sight correspondingly deep.

(1) Taking top of bead in "V," or, say, $\frac{2}{100}$ of the $\frac{5}{100}$ of

its size, will insure hitting the spot aimed at, firing at 100 yards range.

(2) Taking the whole $\frac{5}{100}$ round of the bead in the "V," without any of the stem being visible, would give six inches rise at 100 yards on the object aimed at, which is equivalent to a back-sight elevation required in order to give correct sighting at 200 yards range.

The bead is supposed to be, and generally is, $\frac{5}{100}$ of an inch in diameter; and the stem also is, or should be, $\frac{5}{100}$ of an inch long, the two equalling $\frac{1}{10}$ of an inch in height. Therefore, supposing a rifle is sighted to throw into the bull at 100 yards, with *all the bead* taken into the "V," then, when the sportsman wishes to aim his rifle with the 100 yards sight at an object 200 yards distant, that is six inches higher, he can sight his back-sight "V" so as to see the whole of the stem in addition to the bead fore-sight at the bottom of the "V," which gives him the necessary rise of six inches. With an 18-inch radius under 2000 feet velocity, $\frac{5}{1000}$ equals one inch of elevation when dealing with either back- or fore-sight; therefore, if taking $\frac{20}{1000}$ of bead is sufficient for 100 yards, there are $\frac{30}{1000}$ left, which equal, at the rate of $\frac{5}{1000}$ to the inch, six inches, *i. e.* the average fall in trajectory of rifles constructed on the 2000 feet velocity between 100 and 200 yards.

Suitable sighting, *i. e.* depth of "V" and size of bead and stem, can be arranged in order to carry out this method in all bores and velocities of the express types we are dealing with.

In Chapter IX I have shown that with the highest velocity sporting rifle in use, viz. the ·375/·303, that taking all the bead and stem of the fore-sight through the "V" of the back-sight will correct the drop of the bullet between 100 and 300 yards.

Taking the ·400/·360 cordite rifle, having a velocity of about 1875 feet per second, one of the modern rifles of a moderate velocity, it will be seen from the diagram given that up to 150 yards the 100 yards sight can be used, the drop of the bullet under these conditions being only five inches. Using the 100 yards back-sight at 200 yards with solid bullet the drop is 14 inches, and this error would be corrected by taking a very full bead.

Assuming, then, that the Accelerated Express ·375/·303 stands for the highest type of nitro-express rifle, and the ·400/·360 as the lowest in point of velocity, the foregoing tables and diagrams will

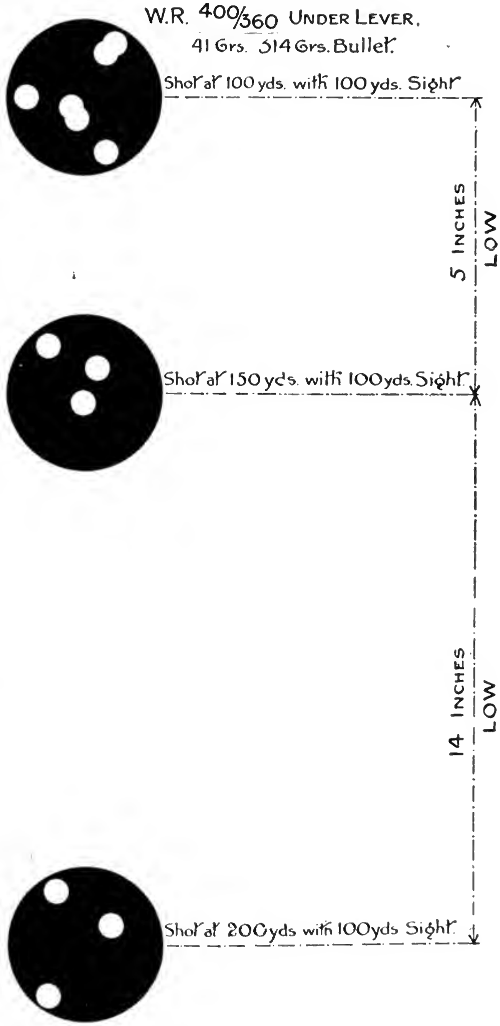


Fig. 165.—Approximate Velocity, 1875 feet per second.

show what little correction it is necessary to make for even 100 yards error in estimating distance.

The sporting capped bullet used in this ·400/·360-bore is, I may explain, of greater length with equal weight than the solid bullet, and the drop of the capped bullet is not so great. For instance, between 100 yards and 200 yards it is 12 inches, as against 14 inches with a solid bullet, as repeated trials have shown, and therefore for sporting purposes the actual correction of the amount of bead taken under the circumstances stated would be less than that given in each case.

CHAPTER XII

SPORTING BULLETS

For the following remarks upon the question of bullets, I am indebted to Mr. Leslie B. Taylor, the managing director of Westley Richards. For seven or eight years he has devoted great attention to the improvement of bullets. He has patented several new and thoroughly successful forms of bullet for pistols, sporting rifles, and modern ball- and shot-guns, and is now recognized as a foremost authority on the construction and use of sporting projectiles.

THE subject of expanding bullets is of vital interest to the sportsman. The lead bullet of the type in use with black powder rifles is well known, and consisted of the solid form, and the hollow point, with or without a copper tube; the expansion of either the one or the other kind being suited to requirements.

Many rifles of the black powder type are in use to-day, but arranged to shoot nitro powder, in which case it has been found desirable and necessary to employ a lead bullet with a nickel base. This nickel base is applied to the lead bullet in order to provide a sufficient gas check and to prevent fusing of the lead, which more or less results from the combustion of smokeless powder. These bullets are, likewise, constructed in the three patterns mentioned as representing the black powder lead bullets.

The introduction of the small-bore high-velocity rifle brought into existence a new kind of bullet, namely, the compound form known as the nickel-coated bullet necessitated in order to overcome the excessive "leading" produced by the ordinary lead bullet. This bullet in itself is much harder and possesses greater penetrative force than the hardened-lead solid bullet of the past, and being of smaller bore and projected with a high velocity, it fails to expand under almost all sporting conditions.

The covering of this bullet or envelope is principally composed of cupro-nickel, but sometimes steel is used, and in rare cases a copper covering is substituted. In the latter case there is a tendency to expand, but it is not of sufficient degree to form a substitute for a reliable expanding bullet.

The increased penetrative quality due to the construction of the nickel-covered compound bullet was further augmented by the small calibre and reduced striking area, which rendered the bullet ineffective unless a vital spot were struck. The energy of the bullet instead of being expended within the object was lost in flight after passing through the animal.

To give a concrete example, I may quote from the *Reports on the Effect of Military Bullets now in use in India*, dated July 6, 1899, which refers to the Chitral campaign. In one passage we read that "the Lee-Metford bullet has not sufficient stopping power. . . . I have been informed that one native of the Swat Valley, who was treated at Chakdara, has recovered from six Lee-Metford bullet wounds, four of which must have been fatal had they been inflicted by *Martini-Henry bullets*. This account is perfectly authentic."

Further, on page 7, "A corporal was accidentally shot by a Lee-Metford bullet. The wound entrance was small and healed in a fortnight. The patient stated that he scarcely felt the wound at the time of its receipt, that it did not make him fall, and that he walked about the camp for some time after its receipt." The report concludes with the following statement: "The Lee-Metford bullet produces much less damage to bones and soft tissues than was anticipated. It is also doubtful if this bullet would stop an enemy unless it took effect in a vital spot, and therefore it is less reliable in fights with frontier tribes *than the Martini-Henry would be*."

The conclusions arrived at by this report are that—

1. The entrance and exit wounds are very similar, the latter being somewhat smaller than the former.

2. The bullet drills through a bone, and does not fracture it.

3. At close quarters, although important structure may be injured, the injury is insufficient to immediately cause shock or death.

4. Hæmorrhage is comparatively slow owing to the smallness of the wound.

It is further recorded, on unimpeachable authority, that at the time of the Jameson Raid the arsenal chief at Pretoria was struck by a nickel-covered solid bullet ·303-bore, which passed through his body without injury, and some few days after he was walking about proudly showing what little effect this missile had upon him.

Many attempts have been made to impart to the highly penetrative nickel-covered small-bore bullets the quality of expansion, which have resulted in the production of the following bullets—

No. 1. Nickel-covered bullet with the outer case cut with a series of slits, known as the "split" bullet.

No. 2. The half-mantle bullet with the solid lead nose exposed.

No. 3. The half-mantle bullet with the solid lead nose made hollow.

No. 4. The half-mantle bullet, with solid lead nose, made hollow, with hollow filled in with a copper tube.

No. 5. The pegged bullet.

No. 6. The capped bullet.

These I think truly represent the various types of sporting bullets in use throughout the world.

The object of all attempts on the part of military authorities to improve the small-bore compound bullet has been to obtain the highest destructive effect consistent with humane considerations, practically to increase the small-bore bullet to the same level of effectiveness as the Martini bullet. This object, so far as military purposes are concerned, has not yet been attained and probably never will be, owing to the intervention of the Hague Conference, by which our Government tacitly consents, at all events in warfare against civilized foes, to forego all kinds of expanding bullets.

The inventors of improvements in the sporting bullets enumerated have had an identical object, and have sought to make these small-bore bullets at least as effective on soft-skinned animals as were the larger bore lead bullets of the past already referred to. It is admitted that the effect of the ordinary military pattern solid nickel bullet upon a soft-skinned animal is, for the time being, very small.

It is not to be wondered at, when we keep in mind the Chitral campaign report, that soft-skinned animals can carry away three or four of these bullets, as the slight wounds inflicted do not seriously trouble them, and the loss of blood arising therefrom being slight, they are difficult to track, and therefore only a small percentage of those wounded are actually bagged.

SOLID NICKEL BULLET.

NO. 1.—THE SPLIT BULLET.

NOS. 2, 3, 4.

NO. 6.—CAPPED BULLET.

NO. 6.—CAPPED BULLET IN SECTION.

FIG. 166.—BULLETS BEFORE FIRING. NOS. 2, 3 AND 4 REPRESENT SOFT-NOSE SOLID, HOLLOW AND COPPER-TUBED.

The solid nickel small-bore bullet is an unsportsmanlike missile, excepting for the bigger mammals, and its adoption for general sport is a retrograde step, which has often resulted in the mere wounding of animals.

During the month of February 1906, there was published a report in the daily press on lion hunting, in which a sportsman stated that the ·303 was absolutely unreliable even at lion—

that after giving an animal seven of them he failed to bag; the writer concluding with the remark that "he took them like pills."

There is no doubt that different conditions of sport, such as the toughness of hide, the thickness and general build of the animal and its vitality, require bullets of varying expansion as generally understood. A certain form of bullet which has performed to one sportsman's satisfaction, under one set of conditions, may be condemned by another sportsman, who may have to deal with an entirely different set of conditions. We hear from one source favourable reports—say of the "split" bullet, and from another, conclusions quite hostile. One man says that the copper-tubed bullet is the best form of expanding bullet in use, and on other occasions we are told that it breaks up too much, and wastes its energy in disintegration.

But whether the reports are favourable or not, the sum of our information is that the sportsman is always looking for an ideal expanding bullet. That he will ever get a bullet which will at every size of game be just to his desire, and, as he may will, exhibit either the quality of penetration or the quality of expansion, is impossible.

But what are the desiderata of an ideal sporting bullet under practical conditions? Is it not a form of bullet which combines in equal degree the two separate qualities of expansion and penetration—one which has a just balance of these two most desirable features?

If we take existing bullets seriatim, we shall be able to estimate which, if any, answer to this condition.

The "Split" Bullet is one which has structural deficiencies, it is liable to strip in the barrel, and has a greater degree of penetration than of expansion.

The Soft-nose Solid Bullet has also the objection that its penetration outweighs its expansive qualities, and if this is improved by making the lead front more exposed, stripping within the barrel may ensue, and in any case greater leading is set up in the barrel, with not only reduction in accuracy but with a certain greater wear upon the rifling.

The Soft-nose Hollow Bullet, with or without the copper tube, is an excellent sporting bullet, and both forms have a great degree of expansion, but each possesses the fault of too great a tendency to break up in the object, and so of reducing effectiveness, especially is this the case when meeting hard muscle or bone.

The Pegged Bullet has a loose peg in the hollow nose, and this tends to break up the bullet on impact.

The Capped Bullet was designed with the object of lessening to the largest possible extent this tendency to break up, while at the same time to insure "setting-up" or "mushrooming," so as to retain the greatest possible weight under impact. There is abundant testimony to show that this has been achieved, and that this bullet at the same time has a larger degree of penetrative force than any other form of expanding bullet.

There is this further unique quality attaching to the capped system of bullet, and it is the larger area of destruction it produces, apart from the "mushrooming," as the term generally understood in connection with expanding bullets. The hollow cap, which is made of very thin metal, "cups-in" on impact, and this "cupping-in" acts like a drill, continually enlarging the area of the channel. This action is continued during the passage of the bullet, and aids expansion or mushrooming, which is a subsequent effect. Thus, it affords this advantage, that whether the capped bullet should expand or not it always makes a larger hole of entry than any other form of expanding bullet, the wound channel increasing in size as the bullet travels within the object, and therefore it is more effective. The cupping-in operation is shown in the extract from the *Field* report, quoted later on, and is, further, confirmed by firing at steel plates; the perforation made by the capped bullets is consistently of larger diameter than that produced by other kinds of expanding bullets.

The foregoing conclusions are the result of actual tests made at live animals and at flesh in this country, as well as of those derived by sportsmen from their actual experience in the pursuit of game, and further have been verified by trials at steel plates in comparison with other types of sporting bullets.

Elsewhere in this work reference has been made to the fact that military and sporting authorities have not chosen a suitable material for testing the comparative effect of bullets; pine planks, wet sawdust, and other unsuitable substances being, as a rule, employed. The conclusions founded upon the behaviour of bullets under these circumstances are unreliable when considered in relation to the comparative effects of the same bullets fired at living game.

Personally I think that tests at beef with any kind of bullet form a satisfactory guide to an estimate of the comparative value of different sporting bullets in point of penetration and expansion. Shin- or thigh-bones afford the best media for ascertaining the solidity or holding together capacity of a bullet. Some may be inclined to object that tests at beef do not represent the actual conditions of shooting at live animals, but they cannot substantiate that objection.

In 1897 a pamphlet was published by Professor Von Bruns, First-class Surgeon-General, attached to the Royal Wurtemberg Ambulance Corps, entitled: *The Effects and Importance of the Mauser Automatic Pistol from a Surgical Point of View*, and it is there stated that shooting experiments carried out on a very large scale by the Medical Department of the Royal Prussian Ministry of War, have definitely settled that it is scarcely possible to point out any material difference between the effect of shots at living and of those on dead bodies.

Again, it has been the practice of military and sporting experimentalists in this country to proceed rather by methods of calculation than by the more practical methods of actual experience. They have resorted to the use of a reduced powder charge in order to give at 50 yards the calculated velocity of the full charge at 200 yards, and firing at 50 yards with this reduced charge they claim to have arrived at the bullet's actual behaviour at 200 yards when using the full charge.

In this respect the methods are again unreliable. In Professor Von Bruns's work it is stated that "Experiments with reduced powder charges at short ranges are a mere make-shift, and do not altogether tally with existing conditions. . . . Experiments show that firing with reduced powder charges does not, as a rule, produce equal, but, on the contrary, inferior effects to those produced by full charges fired at the respective full ranges."

In the numerous trials I have had conducted in order to ascertain the comparative value of the various kinds of bullets in use for sporting purposes, I have invariably fired at the actual ranges, and have used substances which more or less correspond to actual game conditions, so that it will be understood the results I put forward are not calculated, but practical results which I believe may be safely regarded as reliable guides by sportsmen.

The capped system of bullet possesses, as results show, an equal degree of expansion and penetration. Before proceeding to demonstrate the expansive qualities, I will refer to the penetrative capacity of the capped bullet.

A steel plate $\frac{1}{4}$ inch thick was taken, at which the solid and the Westley Richards capped bullet were fired at a range of 100 yards. The solid nickel bullet failed to perforate the complete plate, it penetrated only to a certain extent, the size of the hole being normal. The capped bullet completely perforated the plate, and made a hole considerably larger than the diameter of the bullet, exerting a greater local rending of the metal.

On another occasion, the solid bullet also failed to pass through the plate, while on a third occasion complete perforation was effected.

On no occasion has the capped bullet failed to drive right through a steel plate of the thickness mentioned, and under the same conditions.

From this it will be gathered that the capped bullet has a very high degree of penetration which is so desirable when meeting bone or tough hides. This in no way detracts from its expanding quality after entering the object, which insures fracture of the bone and greater local injury of other substance.

The soft-nose bullet, under identical conditions, makes even less indentation on the steel plate, upon which it breaks up. This, I think, proves that the soft-nose form of bullet has insufficient penetration, and goes to pieces more quickly, thus wasting its energy in broken particles instead of retaining, after impact, a considerable and effective portion of its mass.

In 1904 I carried out trials of the tubed ·303 bullet, which I regard as the best of the older type of expanding bullet in comparison with the copper-capped bullet. They were fired at beef, 22 inches thick, from which all bone had been removed. A piece of leather $\frac{1}{8}$ inch thick being placed over the beef. Range, 200 yards.

Result No. 1. Both the tubed and the copper-capped bullet were pulled up in 14 inches of the beef.

Result No. 2. Firing without the leather cover both bullets penetrated the beef to about 20 inches.

The entrance hole made by the copper-capped bullet, and its subsequent passage into the beef, were considerably larger than with the tubed bullet; further, the tubed bullet broke up into smaller pieces, and in some cases it was difficult to trace them. The copper-capped bullet mushroomed perfectly and did not break up. On weighing the extracted copper-capped bullets, one weighed 180 grs. and the other 170 grs., thus losing respectively 30 and 40 grs. of their original weight. This trial demonstrates the qualities of this form of bullet both as regards necessary penetration and desirable expansion, while at the same time to the largest possible extent retaining a solid and *effective* mass within the animal struck. Independent trials with the same object were, at a later date, carried out at living animals by Mr. Percy Easte, M.R.C.V.S., Lond., of which I append a summary—

Distance: 100 to 200 yards. Objects: Stomach, bowels, liver, lungs and heart.

Heart.—Entry irregular in shape, measuring 2 inches diameter; exit, 4 inches, entirely destroying the lower part of this organ.

Lungs.—Entry irregular, $\frac{3}{4}$ inch in diameter, wound-channel, $1\frac{1}{2}$ inches; exit about the same—not so much internal damage done as in the less elastic organs.

Liver.—Similar in all respects to the heart.

Stomach.—Entry irregular shaped, $2\frac{1}{2}$ inches diameter; exit in one shot measured $5\frac{1}{2}$ inches, and in a second trial 4 inches, there being no difference in the size of entry.

Viscera.—The effects upon these parts were in every way similar to those upon the stomach, with this difference, that the exit varied in size and shape upon the part of the bowel struck, due to the nature of its contents.

A series of trials were made upon the above organs with the tubed bullet at the same distance, and in all cases, except the bowels, were the entries and exits smaller. The internal damage done to the heart, lungs and liver was less, the wound being cleaner cut and less jagged, and of a smaller calibre.

In both cases the penetrative power was very great, but more so in the tubed, it being almost impossible to get the tubed bullet to remain within the body.

It will be observed that the entrance hole made by the capped bullet is in some cases more than six times the size of the bullet's diameter. It is in this respect that the capped system of bullet is superior to all others. The perforations made by other forms of bullet are frequently so small as to be of no more service than the solid bullet, in which case there is not immediate lessening of vitality; but in all cases the wound-channels are considerably narrower than with the capped bullet. This increased wound-channel insures greater shock, and a more immediate deadly effect. It has in this respect reached the aim of all modern investigators, namely, of bringing the small bore's capacity for expansion up to the level of the larger bores which it supplanted.

The larger entrance hole and wound-channel insured by the capped bullet are, it will be seen, of great practical sporting value. Primarily it means a more rapid diminution of vitality so essential when pursuing dangerous game, and, further, the freer emission of blood is a great aid in tracking wounded game. It is for the latter purpose that many sportsmen of to-day adopt the larger calibres. The capped system of bullet gives the desired result even in the smaller bores.

I have received highly satisfactory accounts of the bullet's behaviour under sporting conditions in India, Africa and elsewhere. An interesting experience of the capped bullet is related by an Indian sportsman, who wrote to me as follows—

"Your capped bullet for jungle shooting, where the bullet in its course is *liable to strike up against twigs and stalks before reaching the quarry, is the best I have ever used*. . . . I fired at a black buck through a babul bush at 60 yards or so range, hit the beast on the off shoulder, making a wound 4 by 2 inches, and smashing three ribs. The buck dropped dead to shot. I was using a ·450 capped bullet."

It may be interesting to give here a brief account of the development of this bullet. When the Mauser pistol was first introduced into this country just prior to the Boer War, its small bore ·300 nickel-covered bullet was considered to be ineffective, and there were some grounds for what was, however, a mere belief, when comparing the weapon with the Army service revolver of ·450 bore.

In addition to the solid nickel bullet, the Mauser pistol shot the nickel-covered soft-nose bullet, but this, in practice, was found to have about the same penetration as the solid bullet, retaining its shape, without expansion, even at the hardest substances. In order to lessen the penetrative force and to increase the effectiveness of the bullet, experiments led me to adopt a flat-ended bullet, the end consisting of the lead core exposed, as illustrated.

This bullet, while proving accurate to 200 yards, by its construction had a very deadly effect, making an entrance hole varying from $\frac{5}{8}$ to 1 inch, and continuing this throughout the length of the wound-channel, thus practically trebling the effect of the ordinary solid and soft-nose pointed bullets.

FIG. 167.—WESTLEY RICHARDS ALL-RANGE MAUSER PISTOL BULLET.

To this bullet shortly afterwards was added a metal cap, hollow within, which was introduced principally for the purpose of increasing the ranging power, as well as for insuring a greater degree of expansion of the bullet in order to give heavier shock. This bullet is illustrated on the next page.

The entrance hole made by this bullet, owing to its expansive qualities, due to the metal cap, was also about three times that of the original bullet.

Owing to the success of the capped bullet, the system was applied to other bores, and in 1901 a public trial was conducted before the editor of the *Field*, and I extract the following from his report of this bullet in ·360- and ·400-bores—

"The lead core is firmly held in the jacket by a crimping at the shoulder, which seems to be right in principle, as tending to prevent the separation of jacket and core, a contingency that seems liable to arise with ordinary solid-base bullets. The cap is fastened by a process of spinning the edge into a groove formed by the

20

crimper. The edges in contact are milled, so as to prevent the cap turning on the bullet. In the present case, the bullet seems to take the rifling very well, and shots recovered after firing into tow, show that the gas has been well checked. An interesting feature about the bullet is the behaviour of the nose of the bullet, even when striking a light, fleecy material; the nose seems instantly to assume a cup-like shape, which no doubt accounts for the destruction of tissue around the track of the bullet, of which further particulars are given below."

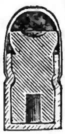


FIG. 168.—WESTLEY RICHARDS CAPPED MAUSER PISTOL BULLET.

"We witnessed trials with two forms of sporting cartridges, as follows—·400-bore: 60 grs. of cordite, bullet weight, 400 grs.; and ·360-bore: 41 grs. of cordite, bullet weight, 314 grs.

"Our wish being to assure ourselves that the bullet satisfied the primary condition of good shooting, we confined our attention to

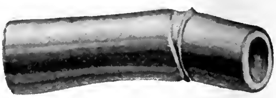


FIG. 169.—BULLET AFTER FIRING INTO TOW.

FIG. 170.—CAPPED BULLET EXTRACTED FROM FLESH.

a firing test for accuracy. Some thirty shots were fired from rifles of these two bores; every shot was accounted for, and struck close to the mark. We also witnessed the shooting of the ·360-bore rifle, when a series of ten shots fell within a space of 4·6 by 2·7 inches at 100 yards. We decided to shoot the rifle again on some less foggy day, but on the next opportunity our whole attention was given to the ·400-bore rifle, with which two good diagrams were made.

"Having thus proved, in the case of the bullets tried, their satisfactory character as projectiles, we next turned our attention to expansion. Although it was self-evident that such a bullet must of necessity expand on entering flesh, we desired to have more precise information. Understanding that Messrs. Westley Richards had caused a very interesting series of veterinary trials to be conducted with the bullet, we asked to be placed in communication with the veterinary surgeon who had done the work. Being convinced as to the seriousness of the trials carried out, and the painstaking thoroughness with which the results had been recorded, we ourselves retained the gentleman who had carried out the tests, employing him professionally to write a supplementary report of a kind likely to be of interest to our readers. Mr. P. Easte, M.R.C.V.S., writes under date November 27, 1901, as follows—

"Remarks.—In all, some twenty shots were fired at all kinds of bones and thicknesses of muscle, at varying distances, but in most cases it was difficult to recover those bullets that had passed through the object fired at. Especially was this so with the solid bullet.

"Comparing the wounds caused by the projectiles, whether on hard or soft substances, those in which most destruction or laceration occurred were caused by the 'New capped.' Noticeably was this so where soft tissues were encountered first—such as a bullet passing between the ribs and into the heart or lungs, also through the abdominal wall into the intestines.

"In these cases the shot-channel was very large, the bullet appearing to expand immediately on impact, and throughout its passage presenting far greater destruction than either the soft-pointed or solid varieties.

"On hard bones the fissures extended longer from the margins of perforation, and more displacement of the splinters took place than was the case in either the solid or hollow-pointed.

"The greatest penetration was reached by the solid, but the injury to muscle and soft tissue generally was far below that caused by either the 'New capped' or 'Soft-pointed,' and in many cases there was a tendency for the nickel covering to split up and leave the bullet.

"The 'Soft-pointed,' on coming in contact with bone first, had a more restricted area of destruction—the fissures not extending beyond point of impact—although the destruction of the part of bone struck was about as complete as that of the 'New capped.'

"In comparing the penetrative powers of the 'Soft-pointed' and 'New capped,' the trials did not point to much difference."

Since then the capped system has come into more general use, and is now made in practically all sporting weapons. From the Mauser pistol size up to ·375-bore high-velocity nitro rifle, it is made with a copper cap, and in ·400 and upwards, with a nickel cap.

A copper-capped bullet is found to expand better while retaining the desired penetration, in the smaller bores, and the harder nickel cap is considered preferable for the larger bores mentioned.

Some time ago, when the ·375/·303 Accelerated Express rifle was introduced, the copper cap was made with an indented nose, but, effective as this bullet was, on the whole, it is not considered so satisfactory in all respects as the "Ogival" nose without any indentation.

In considering the question of expanding bullets, the sportsman has to take into account the velocity of his rifle and the toughness of the hide of the animal, and its weight. With a lightly-built animal, and the best form of expanding bullet driven with the highest velocity yet attained, it is hardly to be expected that expansion will invariably result. For such light game it would be far better to take a lower power rifle. With high-velocity rifles of small bore, with small animals such as black buck, the effect of the bullet may be that recorded in the report referring to the Chitral campaign, if the bullet should happen to strike only tissue. In such case it is more likely that it would pass entirely through, with but little expansion, no matter what the system of bullet, but the drilling effect of the capped bullet will always ensure a larger wounding effect under any circumstances.

In the military text-book on small arms, 1904, we read with reference to expanding bullets the following—

"At long ranges, where velocity is low, the shock of impact against flesh is not sufficiently great to alter the shape of an expanding bullet, it then causes no more damage than if its envelope had been continuous."

This remark appears to be confined to the short-mantle or soft-nose bullet, or bullets of that type, although at the date of writing the capped bullet had been in existence three or four years; but this remark, in any case, is not true with regard to the capped bullet.

In tests I have made with the ·375/·303 capped bullet, at 100, 200, 300, 400, 500 and 600 yards, I have found that alterations in the shape of the bullet are maintained up to 600 yards, the maximum distance at which I have tested it. The copper-capped ·303 bullet at 600 yards, fired into beef 19 inches thick, invariably alters its shape, and otherwise sets up. In some

FIG. 171.—ACCELERATED EXPRESS ·375/·303 COPPER-CAPPED BULLETS EXTRACTED FROM BEEF. FIRED AT 600 YARDS.

cases the bullet broke up, leaving the copper cap within the beef, and in other cases a good mushrooming effect was produced.

In a public trial of Axite powder at Kynoch's Witton works, held June 27, 1905, the expanding and effective qualities of the capped bullet were demonstrated at a range of 300 yards. The bullet was fired at a card target, placed over a wooden box containing wet sawdust. The thickness of the wood was about $\frac{3}{16}$ inch. The hole made in the cardboard was normal, but in the matchboard it measured over 1 inch in diameter, while later on the bullet was extracted from the sawdust packing in which it had "set up" or "mushroomed."

From these and other experiments I have formed the conclusion that, given a bullet of construction like the copper-capped bullet, so long as the bullet has sufficient remaining velocity to penetrate flesh, "setting up" would occur at all ranges, and that the contention advanced in the military text-book cannot be upheld.

The following particulars were furnished to me by an independent experimentalist, who took the solid, soft-nose and capped bullet, respectively of ·303-bore, and fired them at a piece of lead 1 inch thick by 3 inches long with the following results—

No. 1. Solid Bullet.—Entrance hole, $1\frac{1}{4}$ inches diameter; exit hole, not clear. Lead pushed aside about 1 inch in diameter.

No. 2. Soft-nose Bullet.—Entrance hole, $1\frac{1}{2}$ inches diameter. Bullet failed to perforate, the lead only being partially broken through.

Fig. 172.—No. 1. Solid Bullet.

Fig. 173.—No. 2. Soft-nose Bullet.

No. 3. Capped Bullet.—Entrance hole, $1\frac{3}{4}$ inches diameter, and greater local effect. Complete perforation, the exit hole measuring $1\frac{1}{2}$ inches, and also showing greater local disturbance at the point of exit.

These confirmatory experiments demonstrate that the capped bullet has greater penetration and expansion than the soft-nose bullet, and is not inferior in penetration to the solid bullet at any substance likely to be encountered in sport. It is more destructive than either of these bullets by reason of the larger area of its effect. The capped bullet, in short, possesses even greater advantage as compared with the soft-nose bullet than the latter does over the solid type.

It may have been an unhappy attempt in the department of nomenclature to christen this bullet the "Capped Bullet," but for better or worse there it remains. My eyes have been opened to the fact that many in the sporting world have interpreted the title to mean that it is "loaded with an explosive," and that to such the term "capped" has a similar significance to that appertaining to the percussion-cap. Of course this is nothing of the kind, and therefore it is perhaps necessary to make this explanation—that the cap is a mere metal covering joining the rear portion of the bullet, and leaving a space between the end

FIG. 174.—NO. 3. CAPPED BULLET.

of the inner lead core and the cap, this cavity aiding considerably in the expansion of the bullet, besides insuring a greater degree of accuracy and steadiness in flight.

But I am not surprised at the confusion of thought, since personages of highest authority in military circles not long ago synonymously used the words "explosive" and "expansive"—words by no means interchangeable. If they were, one might, for instance, just as well refer to an "expanded" idea as to an "exploded" idea.

The late Sir Samuel Baker advocated solid soft-lead bullets in ·577-bore for use at soft-skinned animals, and hardened bullets for the tougher game, and his experience is confirmed by other big game hunters using the black powder rifles. Such weapons are now often used with a charge of smokeless powder equivalent to the black powder charge, and a lead bullet which is made with a nickel base, this construction being found necessary for use with the nitro powder.

This modification in no way prevents the use of either the solid, soft-, or hard-nose bullet recommended by such authorities. Experience seems to teach that the copper-tubed lead bullets are not so reliable as the solid bullet made of soft lead.

The introduction of high-velocity rifles, as we have seen, rendered necessary the employment of a metal mantle to protect the lead for the purpose of preventing the stripping of the lead bullet and its consequent injurious effect upon the barrel, resulting in impaired accuracy. This involved the sacrifice of the quality of expansion in the bullet. The nickel-coated bullet generally employed does not set up even when used against the tough hide of a rhino, and only slightly deforms. In the case of large game of lesser toughness, no alteration results in the shape of the bullet, which may pass through the animal in its original shape, except for the indentations due to its passage through the grooved barrel.

The solid pure lead bullets of large bore, with their larger striking surface, recommended by Sir Samuel Baker and others, possessed in no small degree the combined qualities of penetration and expansion, two indispensable qualities of an efficient sporting bullet. The nickel-coated bullet, constructed upon the capped system, exhibits these desiderata to a degree never before achieved, and in this respect is a more reliable bullet than the solid soft-lead bullets of the past. It can confidently be recommended as superior and more useful in all circumstances where those lead bullets were formerly considered to be the most efficient of their kind, on account of the enormous area of injury it produces on impact, and its exceptionally large wound-channel.

The advantages of the Westley Richards capped expanding bullet, as compared with other sporting bullets, are, viz.—

1. Greater expansion and greater shock.

2. In conjunction with a greater degree of penetration than that possessed by any other kind of sporting bullet.

3. A larger wound-channel, and therefore greater hæmorrhage.

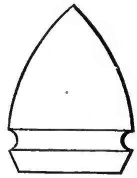
4. Less liability to break up in the object.
5. A more humane or sporting bullet, because more immediately effective.

The capped form of bullet originated in 1899 was soon seen to be applicable to all kinds of bullets, lead or otherwise, of the older type. In 1899 the cap was made either solid with the bullet, or else hollow, as described. In 1900 this cap was tested by me on lead bullets, with the result that I found their accuracy was considerably increased; such bullets also have much greater expanding qualities than the older form.

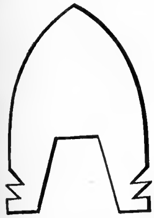
By attaching this cap, either made solid of light metal, or hollow, to the ball- and shot-gun bullet of lead, which had been in existence for some twenty years, I was able not only to increase the ranging power of the bullet, but also the penetration when desired; or by using a lead cap instead of the brass or copper cap, to add to the degree of expansion. This system has been dealt with in a previous portion of the book, but as it is one that closely concerns the subject of bullets, these remarks would be incomplete without reference to the bullets in use for the ball- and shot-guns of the Explora and Fauneta type which Westley Richards have introduced.

In addition to the hollow brass- and lead-capped bullet, I have introduced a new method of constructing lead bullets in one piece externally, and having the appearance of the solid bullet, but hollow within from end to end, or for any portion of the external length for the purpose of giving the desirable degree of expansion. This bullet, made wholly of lead, is capable of accurate flight to long ranges, and yet will mushroom up instantly on impact with the softer-skinned animals, in this respect being far superior to any other bullet. This fact will be recognized when it is understood that the bullet is a complete shell, of the same weight, nevertheless, as the 730-gr. bullet, brass-capped, and is therefore capable of inflicting a deadly blow, which is further augmented by the facility with which the bullet crushes up on impact.

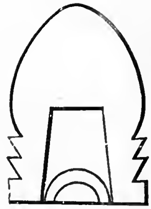
This bullet differs from all previous forms of lead bullet in the important feature of being solid at the base, hollow within, and constructed in one piece, and of having a better balance owing to this novel construction. Previously, lead bullets having hollows within, of which the Snider is the chief example, were designed upon lines the reverse of the "All-lead" Explora bullet. The



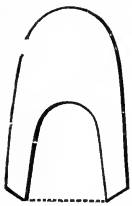
No. 1.—Col. Thierry's Bullet.



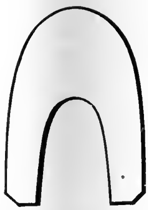
No. 2.—Delvigne Bullet.



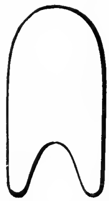
No. 3.—Tamisier Bullet.



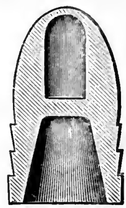
No. 4.—Minié Bullet.



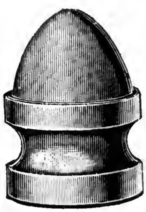
No. 5.—Minié Bullet.



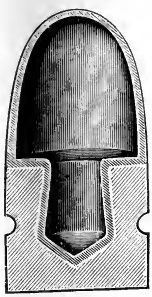
No. 6.—Pritchett Bullet.



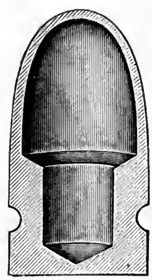
No. 7.—Snider Bullet.



No. 8.—Fosbery Bullet.



No. 9. Sectional view of the Leslie Taylor Brass- or Copper-Capped or Aluminium-Capped Explora Bullet. 12-Gauge.



No. 10. Sectional view of the Leslie Taylor All-Lead Explora Bullet. 12-Gauge. Actual Size.

Fig. 175.—The Latest Forms of Cylindro-Conoidal Bullet.

hollow at the rear of the Snider renders it comparatively lighter at the base than at the nose. The "All-lead" Explora bullet, on the contrary, is heavier at the base than at the nose—a far more practical form of projectile, insuring a steadier spin and more constant flight.

The Forsyth explosive bullet was made with a hollow to receive the detonating compound, the base of the bullet being subsequently wedged in and swaged over. This construction was mechanically unsound, and the two parts easily became loose. Although possibly a good explosive bullet, it was ill designed and not capable of accurate flight.

Above are given illustrations of all the known forms of Ogival or cylindro-conical lead bullets of the past, in comparison with modern bullets of a similar type.

In all these earlier forms of bullet here illustrated, the object of the hollow at the base was to produce expansion of the bullet within the rifling. The Snider bullet was constructed with cavities formed both within the fore part and at the base, the latter being filled with a boxwood or clay plug. The principal recommendation of this method was claimed to be a more certain and uniform expansion, and subsidiary advantages consisted in decrease of fouling and corresponding facility of loading with increased accuracy of shooting, due to the extra length of bullet, and to getting its centre of gravity in the proper place.

The "Explora" and "Fauneta" bullets initiated (1) lead bullets with a separate cap of brass or suitable metal which permitted the construction of a bullet with a solid base and an unbroken hollow within, giving thereby greater length for insuring accurate long-range flight without any increase in weight; (2) lead bullets with lead cap, or all lead in one piece, solid base and hollow within from end to end, practically for the same object in regard to flight, but also for the important purpose of augmenting expansion by mushrooming up without going to pieces.

The system of constructing lead bullets with a metal point hollow has brought about altogether new conditions. In the Fauneta express ball- and shot-guns of 28-bore, instead of making for the purpose of expansion a bullet of all lead, the lead bullet with a hollow copper cap has been substituted, which is found to expand satisfactorily. With such light bullets as are necessary in order to obtain the increased velocity, the all-lead form is not found to have sufficient rigidity.

In the 20-bore ball- and shot-gun of the Fauneta type, it is possible to obtain a bullet of the desired length for accurate ranging power made entirely of lead, the weight of which permits of a structure which will resist the pressure of the rifling when driven by a fairly high velocity through the bore of the barrel, thereby insuring both accurate flight and ready expansion on impact.

The Sherwood bullet adopted for sport is one made with a nickel mantle ending in a copper cap, and this form has done remarkable service in sport at a variety of animals in Scotland, India, Burmah, and British Columbia, which subject has been dealt with in a previous chapter.

Westley Richards have introduced for use in their new miniature rifle, the Minex, a nickel-base lead bullet with a brass cap, similar in principle to the Fauneta bullet.

The bore of this rifle is ·298. The bullet weighs 140 grs; for

FIG. 176.—MINEX BULLETS.

sporting purposes—owing to its great expansion—it is superior to the excellent Sherwood copper-capped bullet. It flies with great accuracy.

Above are illustrated the Minex bullets before and after firing at 100 yards. As shown they mushroom perfectly. The Minex rifle, referred to in another chapter, has a velocity of 1450 feet per second, and in conjunction with this kind of bullet makes a very effective sporting combination, having a far more deadly effect upon small game than bullets of higher power of penetration, but not designed for ready and complete expansion.

Many sportsmen still prefer the old lead bullet, and with smokeless powder, the only kind hitherto available is the lead bullet with nickel base already referred to. The tubed lead bullet of this description breaks up too easily, while the solid lead nose cannot always be relied upon for the necessary expansion.

Both difficulties would be obviated by the use of these bullets constructed with a small brass cap or tip upon the Minex principle, by which is secured ready expansion at soft-skinned animals, and a rigidity or absence of tendency to break up at bone, being in these two important respects superior to either the tubed, hollow, or solid-nose lead bullets. Such bullets permit the construction of light medium game rifles of superior power and accuracy to the old express system for use against deer and all soft-skinned animals, including tiger, as follows—

WESTLEY RICHARDS NITRO-EXPANSIVE EXPRESS RIFLES, DESIGNED AND CONSTRUCTED FOR USE WITH CARTRIDGES GIVING THE HIGHEST DEGREE OF EXPANSION. PATENT LEAD BULLETS WITH NICKEL BASE AND METAL TIP AT NOSE.

BORE, ·360.

Cartridge case	$2\frac{1}{4}$ inch straight taper.
Powder charge	·53 grs. Cordite or equivalent in Axite
Weight of bullet	185 grs.
Velocity	1700 feet per second.
Energy	993 foot-lb.
Weight of rifle	6 lb. 10 ozs.

BORE, ·400.

Cartridge case	$2\frac{3}{8}$ inch bottle-necked.
Powder charge	40 grs. Cordite or equivalent in Axite.
Weight of bullet	230 grs.
Velocity	1850 to 1900 feet per second.
Energy	1747 foot-lb., approximately.
Weight of rifle	7 lb. 4 ozs.

BORE, ·450.

Cartridge case	Bottle-necked No. 1.
Powder charge	50 grs. Cordite or equivalent in Axite.
Weight of bullet	325 grs.
Velocity	1950 feet per second.
Energy	2741 foot-lb.
Weight of rifle	8 lb. 8 ozs.

BORE, ·500.

Cartridge case . . .	3 inch straight taper.
Powder charge . . .	53 grs. Cordite or equivalent in Axite.
Weight of bullet . .	340 grs.
Velocity . . .	1925 feet per second.
Energy	2794 foot-lb.
Weight of rifle . .	8 lb. 14 ozs.

BORE, ·577.

Cartridge case . . .	3 inch straight taper.
Powder charge . . .	77 grs. Cordite or equivalent in Axite.
Weight of bullet . .	600 to 610 grs.
Velocity . . .	1700 feet per second.
Energy	3910 foot-lb.
Weight of rifle . .	10½ lb.

The following table of velocities and energies, calculated upon a bullet of 100 grs. weight, was furnished to me by Rear-Admiral Julian A. Baker. The table speaks for itself, the calculations being based on the well-known formula $E = \frac{W \times V^2}{2g}$.

For any given weight of bullet the energy must be multiplied by the number of 100 grs. the bullet weighs, viz. 480 grs. by 4·8, 250 grs. by 2·5, and so forth.

Velocity, feet per second.	V^2.	Energy $= \frac{V^2 \times 100 \text{ gr.}}{7000 \times 64{\cdot}4} = \frac{V^2}{4508}$.	
		ft.-lb.	Difference, lb.
2500	6250000	1386	28
2475	6125625	1358	27
2450	6002500	1331	27
2425	5880625	1304	27
2400	5760000	1277	26
2375	5640625	1251	26
2350	5522500	1225	26
2325	5405625	1199	26
2300	5290000	1173	25
2275	5175625	1148	25

Velocity, feet per second.	V^2.	Energy $= \frac{V^2 \times 100 \text{ gr.}}{7000 \times 64\cdot4} = \frac{V^2}{4508}$. ft.-lb.	Difference, lb.
2250	5062500	1123	25
2225	4950625	1098	25
2200	4840000	1073	24
2175	4730625	1049	24
2150	4622500	1025	24
2125	4515625	1001	23
2100	4410000	978	23
2075	4305625	955	23
2050	4202500	932	23
2025	4100625	909	22
2000	4000000	887	22
1975	3900625	865	22
1950	3802500	843	21
1925	3705625	822	22
1900	3610000	800	21
1875	3515625	779	20
1850	3422500	759	21
1825	3330625	738	20
1800	3240000	718	20
1775	3150625	698	19
1750	3062500	679	19
1725	2975625	660	19
1700	2890000	641	19
1675	2805625	622	19
1650	2722500	603	18
1625	2640625	585	18
1600	2560000	567	17
1575	2480625	550	18
1550	2402500	532	17
1525	2325625	515	16
1500	2250000	499	17
1475	2175625	482	16
1450	2102500	466	16
1425	2030625	450	16
1400	1960000	434	15
1375	1890625	419	15
1350	1822500	404	15
1325	1755625	389	15

Velocity, feet per second.	V^2.	Energy $= \frac{V^2 \times 100 \text{ gr.}}{7000 \times 64{\cdot}4} = \frac{V^2}{4508}$.	
		feet-lb.	Difference, lb.
1300	1690000	374	14
1275	1625625	360	14
1250	1562500	346	14
1225	1500625	332	13
1200	1440000	319	13
1175	1380625	306	13
1150	1322500	293	13
1125	1265625	280	12
1100	1210000	268	12
1075	1155625	256	12
1050	1102500	244	11
1025	1050625	233	12
1000	1000000	221	11
975	950625	210	10
950	902500	200	11
925	855625	189	10
900	810000	179	10
875	765625	169	9
850	722500	160	10
825	680625	150	9
800	640000	141	8
775	600625	133	9
750	562500	124	8
725	525625	116	8
700	490000	108	7
675	455625	101	8
650	422500	93	7
625	390625	86	7
600	360000	79	6
575	330625	73	6
550	302500	67	6
525	275625	61	6
500	250000	55	5
475	225625	50	5
450	202500	44·9	—
425	180625	40·0	—
400	160000	35·4	—
375	140625	31·1	—

Velocity, feet per second.	V^2.	Energy $= \frac{V^2 \times 100 \text{ gr.}}{7000 \times 64{\cdot}4} = \frac{V^2}{4508}$.	
		feet-lb.	Difference, lb.
350	122500	27·1	—
325	105625	23·4	—
300	90000	19·9	—
275	75625	16·7	—
250	62500	13·8	—
225	50625	11·2	—
200	40000	8·8	—
175	30625	6·7	—
150	22500	4·9	—
125	15625	3·4	—
100	10000	2·2	—

In the statements given I have endeavoured to view this question of bullets with the strictest impartiality, and the conclusions are, I believe, derived from a just estimate of actual facts.

NILGHAI SHOT WITH A LESLIE TAYLOR ·360 CAPPED BULLET.

CHAPTER XIII

MINIATURE RIFLES FOR MATCH, TARGET, AND SPORTING PURPOSES

ALTHOUGH for many years miniature rifles of various bores have been used for different purposes in this country, their place in the sportsman's armoury has been neither important nor large. Hitherto, our conception of this type of weapon has been confined to the rook- and rabbit-rifle, and during the twenty years that I have observed this question, a considerable number of foreign saloon-guns, principally from Belgium, and similar weapons, mostly in ·22-bore, made in America and popularized by the Winchester Company, the Marlin Company, and others, have found their way into the good graces of not a few sportsmen.

The ordinary rook- and rabbit-rifles, the Belgian saloon-gun, and the American ·22, are too well-known for me to refer to further. In order to give an accurate and detailed account of each variety of miniature rifle embraced in those enumerated, one could fill a respectable volume without, perhaps, rendering much useful service to the reader. However, it may be worth while to place on record the principal types of weapons in this category, giving their size, load, and range, as also their system of breech-action. Rook-rifles as used in this country may be said to be chiefly represented by the following bores—

·297/·230 short, 3 grs. black powder, 37 grs. bullet. Velocity, 800 feet per second.

·297/·230 long, 5 grs. black powder, 37 grs. bullet. Velocity, 1220 feet per second.

·250, 7 grs. black powder, 56 grs. bullet. Velocity, 1100 feet per second.

·295, sometimes called ·300, 10 grs. black powder, 80 grs. bullet. Velocity, 1100 feet per second.

·360, No. 5, 14 grs. black powder, 134 grs. bullet. Velocity, 1000 feet per second.

These cartridges are also loaded with Cordite and Axite powders, which give an increase of 50 to 100 feet in velocity. They are made as follows—

With side-lever action, and external hammer, weight $5\frac{1}{2}$ lb.

With top-lever action, and external hammer, weight $5\frac{1}{2}$ lb.

With top-lever action, hammerless barrel-cocking principle, weight $5\frac{1}{4}$ lb.

With under-lever sliding-block action, weight 5 lb. 12 oz.

With Martini action, weight 5 lb. 12 oz.

FIG. 177.—SIDE-LEVER ACTION, REBOUNDING LOCK.

The old ·380- and ·360-bores have gone out of use as being too powerful, and not sufficiently accurate.

The ·22-bore I have not mentioned in this connection, as it is too much of a toy to merit serious attention, although it has found favour among certain people principally on account of the cheap price, both of the weapon and its ammunition, which are mainly American. These weapons, doubtless, would be made by British firms, but for the fact that it would pay no manufacturer to lay down costly machinery and tools for the production of the comparatively small number bought in this country. Such trade could alone be rendered profitable with the aid of those other markets which are now closed to our gunmakers by heavy tariffs.

It is, however, inconsistent with the requirements of the sport to adopt the ·22-bore for rabbit shooting. The ·250-bore is occasionally used with success, but more often than not it is found

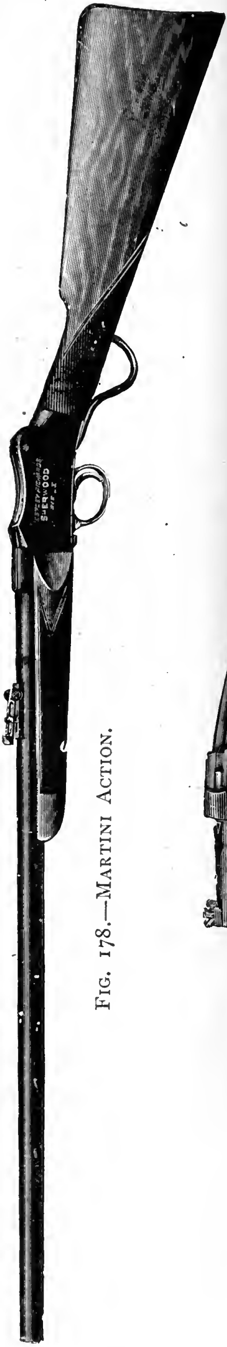


Fig. 178.—Martini Action.

Fig. 179.—Under-lever Sliding-block Action.

Fig. 180.—Top-lever Action, Hammerless Barrel-cocking Principle.

to be of insufficient power to be thoroughly reliable for this kind of shooting. The ·250-bore rifle with bullet made on the Minex principle would doubtless prove effective.

For all-round efficiency ·300-bore is now generally recommended, but the adoption of this calibre is more or less of a compromise which has taken into careful account safety, this rather erring in the direction of modified ranging power. Even with this bore, with its present power, however, unless there is sufficient background of clear country beyond, errors of aiming may result in disaster to some wayfarer or farm-labourer in the fields situated some few hundred yards away from the shooting-grounds. But for this fact, larger and more powerful cartridges and bores of barrels would have been adopted even for the bagging of such small game as rabbits. I think I shall not be far wrong when I say that the ·300-bore is the best all-round miniature rifle for rook and rabbit shooting.

The introduction of nitro powder, as in the case of other weapons, has considerably increased the usefulness of miniature rifles. And, moreover, since the late Lord Salisbury, in a memorable speech, pointed out the necessity of all male adults becoming proficient rifle shots, a new interest in miniature rifles has been created, and a great stimulus given to their manufacture and development. Further, this has led to a greater consumption of the foreign-made small calibre weapons to which I have alluded, which has mainly resulted in increasing the foreigners' trade. But, as opposed to this, it has afforded some compensation in the introduction of two or three new weapons, the sole product of English manufacture. These have not only brought fresh competition into miniature rifle manufacture, but have changed the conditions of miniature rifle shooting, and lifted it out of the drawing-room atmosphere and the toy element into the open and practical field of trained and serviceable marksmanship.

One of these is the ·310-bore, which is principally associated with the name of Mr. Greener, and is indeed an excellent weapon, as the records of the last few Bisley meetings show, and has, moreover, the merit of cheapness. This weapon, termed the "Sharpshooter," is made with the Martini action; it shoots a cartridge as follows—

Weight of powder, $5\frac{1}{2}$ grs. cordite.
Weight of bullet, 120 grs. lead.
Muzzle velocity, 1320 feet per second.
Weight of rifle, about $6\frac{1}{4}$ to 7 lb.

Another is the Westley Richards "Sherwood" rifle, which is also built upon an improved system of Martini action, which I will subsequently describe.

Charge of powder, 7 grs. cordite.
Weight of bullet, 140 grs. lead, with nickel base and lead front; or nickel-covered bullets with patent copper cap.
Muzzle velocity, 1450 feet per second.
Weight of rifle, 6 lb. 5 oz. to 6 lb. 9 oz.

In comparing the ballistics of the two cartridges, according to Messrs. Kynoch's tables, I find the following differences—

The ·310. Muzzle velocity, 1320 feet per second.
The "Sherwood." Velocity, 1450 feet per second.
Difference in favour of "Sherwood," 130 feet per second.

The ·310. Striking velocity at 300 yards, 890 feet per second.
The "Sherwood." Striking velocity at 300 yards, 992 feet per second.
Difference in favour of "Sherwood," 102 feet per second.

The ·310. Height of trajectory curve at half range, 100 yards, 3·25 inches.
The "Sherwood." Height of trajectory curve at half range, 100 yards, 2·44 inches.
Difference in favour of "Sherwood," ·81 inch.

The ·310. Height of trajectory curve at 300 yards, 43·0 inches.
The "Sherwood." Height of trajectory curve at 300 yards, 33·7 inches.
Difference in favour of "Sherwood," 9·3 inches.

Both these weapons are accurate up to 500 yards, and are therefore eminently suited for teaching proficiency in marksmanship to the youthful civilian who takes up shooting for the combined reasons of intelligent recreation and patriotic duty. Still, it would seem that civilian rifle shooting has received but a cold welcome from the heads of our official military departments. At all events, without any intelligent or adequate reason, they have preferred to regard it from the lowest elementary standpoint in respect of both aiming and shooting. It is quite obvious that it need not be so considered if a fair and proper estimate were taken of the weapons and other adjuncts of this art.

With these two excellent and effective miniature rifles in existence, it is difficult to understand upon what grounds the National Rifle Association, ever since Lord Salisbury's famous pronouncement, has refused to entertain competitions with these weapons beyond 100 yards range at Bisley. It is not because accurate marksmanship is not to be achieved at longer ranges, for there is abundant testimony to prove that these weapons are capable of performances which cannot be surpassed at 200 to 300 yards even by the service rifle. It is not because the National Rifle Association has not been requested to consider the question of an extended range for miniature rifle shooting, this has been plainly put before them by Westley Richards, and I believe other rifle manufacturers, without avail, and up to the present time they adhere to 100 yards as the limit for civilian shooters, and apparently indulge the vain hope that practical and useful marksmanship can be taught under such limited conditions of range. Happily, there are in existence civilian clubs which practise shooting at much longer ranges, and it will be owing to them, and not to the National Rifle Association or the military authorities who direct its policy, that we shall have in the near future a large number of proficient civilian marksmen.

Our colonists of Australia and New Zealand regard the matter in a very different light. They do not limit the cadet shooting to the petty range of 100 yards. Their school-boys, who form the cadet corps, are in the habit of shooting up to 400 yards.

When the Prince of Wales visited New Zealand, His Royal Highness took particular note of these trained and efficient youthful marksmen, and in a speech made soon after his return home mentioned these cadet corps as an example for the War Office, which still thinks that 100 yards, and a ball cartridge that can only be compared to a toy, represent the conditions for nationally cultivating civilian marksmanship.

In a report from Lieutenant-Colonel Loveday, commanding public schools cadets, presented to both houses of the General Assembly, New Zealand, 1903, we find the following—

"The shooting of the cadets from the various registers inspected is very encouraging, and in several cases both 'possibles' and near 'possibles' have been made; and there can be no doubt that in the *near future* the adults will find that the cadets will be able to hold their own against them. The miniature Martini-Henry rifles supplied by Messrs. Westley Richards are very accurate weapons, and reflect great credit on that firm."

It will thus be seen that owing to the fact that the cadets were trained with a miniature rifle shooting accurately to 400 yards or more, the hope is indulged as to their holding their own against the adults. With rifle shooting conducted at 100 yards with toy ammunition of the ·22-bore type, no such proficiency could be achieved, and comparison with the shooting obtained by adult corps with the service arm would not be possible.

In further reference to this important question, Lieutenant-Colonel A. Paul, commanding the New South Wales public schools cadet force, reported on August 5, 1905, as follows—

"The Westley Richards cadet rifle has, after several years' experience, proved a most effective and reliable weapon, and is giving every satisfaction. Those delivered in June last were tested at 200, 300 and 400 yard ranges, by the adjutant and quarter-master, also by expert shots—military instructors—and by a squad of cadets. The tests were highly satisfactory."

It will be observed that neither the authorities nor the cadets entertained the smallest idea of testing them at 100 yards range, a distance they apparently ignore, but is yet considered one all-sufficient for the purpose of training civilian clubs in this country. In fact, the War Office and National Rifle Association's control of miniature rifle shooting seems to be of a nursery character.

In South Africa mere youths, who form the cadet corps, are trained to shoot with the Martini carbine, which shoots 76 grs. of powder and 480 grs. bullet, and gives a recoil equal to, if not in excess of, the service ·303 rifle. The shooting of such a weapon trains them not only to long-range marksmanship, but to endurance, neither of which qualities can be secured by toying with the insignificant little ·22 rifle, which is more suitable for a shooting gallery.

This is no exaggeration, because indoor shooting with miniature rifles is one of the accepted methods on the part of the authorities who support the civilian movement. It is true that the N.R.A. regulations for indoor shooting permit the use of bullets of 80 grs. and 100 grs., having respective velocities of 1000 and 1200 feet per second over 20 yards; such ballistics, however, better apply to outdoor work, but there is a wide difference between such weapons and a ·22 short cartridge shooting 3 grs. of powder and a 30 grs. bullet. These smaller weapons, while they may be useful like the higher types of air-gun for teaching aiming and sighting, rightly considered are not practical outdoor weapons.

But if these conditions prevail, the British manufacturer can supply rifles to meet the demand, and there is no occasion to resort to rifles of foreign manufacture merely from the fact that the encouragement of this kind of elementary shooting in other countries has given their manufacturers the start.

The ·22 long cartridge and the ·22 long rifle cartridge are very accurate, the latter is superior, and with it very good results are obtainable at 150 and 200 yards under favourable conditions of wind and light. Experienced marksmen have informed me that in a fairly strong wind, as much attention has to be bestowed upon the question of wind with the ·22 long rifle at a range of 150 yards, as would be necessary when shooting the service rifle at a distance of 1000 yards. Under the same conditions, taking the highest type of miniature rifle under Bisley conditions, the Westley Richards Sherwood, the comparison would be with the performance of the Lee-Enfield service rifle at 500 yards, thus showing that the larger bore and more powerful miniature rifles are better adapted for outdoor shooting, where the factors of light and wind must be considered. This requires trained eyesight and skilled judgment, by which alone proficiency in marksmanship can be attained.

The Westley Richards ·300-bore Sherwood rifle possesses great merits as regards its ammunition, mechanism, and sight equipment. With respect to the foremost of these three, it was stated in the

Field of August 6, 1904, "That the Sherwood cartridge may be regarded as the closest-shooting ammunition for its class at present on the market." This cartridge has also many recommendations for sporting purposes, which are dealt with later on.

The action is upon the Martini system, with improvements of a most important nature. It is fitted with an automatic indicator, which is always in sight when the rifle is cocked, and disappears when the trigger is pulled.

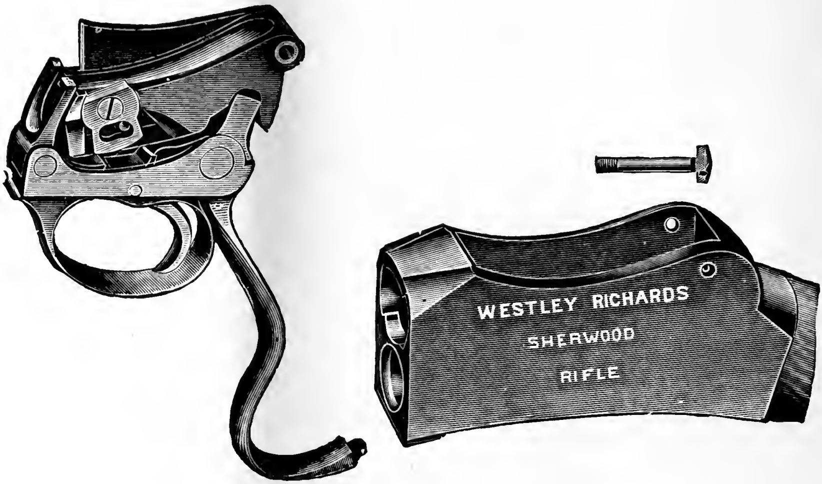


Fig. 181.—Detachable Action.

All the internal lock mechanism is removable by hand. A pin taken out by hand frees the lock-work, and it can then be readily detached for cleaning or repair, or any other purpose, and is as easily replaced.

The Francotte system of removable action is well known, and possesses undoubted merit. The mechanism is mounted upon a separate frame, which is inserted within the shoe or breech. This arrangement somewhat adds to the weight.

Further, the Sherwood possesses a detachable barrel. There are many systems of detachable barrels now in use, but I regard the Westley Richards system as the simplest and best. When, some years ago, this firm introduced this detachable barrel, which is

Fig. 182.—Detachable Action and Barrel.

attached by solid locking lugs, and secured in position by the fore-part, I advanced the opinion that, while the locking lugs were

FIG. 183.—COMPONENT PARTS OF WESTLEY RICHARDS FIXED CADET RIFLE ACTION.

secure, the fore-end attachment was of such a character that it might not absolutely insure freedom from lateral motion of the barrel within its breech.

For sporting purposes, even if my anticipations were confirmed, and wear occurred at this point, I do not consider that it would affect shooting, but I am glad to note that, in their later forms of detachable barrel, Westley Richards have improved the fore-end attachment. This, after trial in high-power rifles, has proved to be very secure. With such an attachment the detachable barrel is practically as solid as the fixed barrel. It will be seen that the spring ball, which receives into a corresponding socket, prevents any lateral movement of the barrel. This ball is made of hard steel, and is therefore subject to little or no wear under friction. But wear, whether more or less, is taken up by the pressure of the spiral spring against the steel ball which forces it further forward, and so acts as a compensating fastening (Figs. 182 and 184).

Sights for the Sherwood Rifle.

Too much importance cannot be attached to the question of the sighting of rifles, for the purpose of securing accurate results and as an aid to marksmanship. The sights fitted to the Sherwood rifle have reached a high degree of development upon lines which appeal to the thoughtful and intelligent marksman. They afford greater facilities for accurate aim under difficult weather conditions than are possessed by even the best European service weapons. For instance, we have the important qualification of making allowance for wind by a mechanical movement enabling the shooter to laterally adjust the sight in order to counteract the force of the wind upon the flight of the bullet.

All military authorities in the past alike have refused to acknowledge the necessity of a mechanical arrangement of any kind for making wind-gauge allowance. Their attitude may have been caused by the absence of reliable and durable systems, but it is, I consider, the more likely due to a desire not to confuse the ordinary soldier, whose intelligence may have been underrated or his education neglected. Marksmen, however, have invariably adopted with eagerness such appliances wherever the opportunity presented itself.

In another respect, equally essential to the proper training of the practical marksman, the sight possesses an improvement in the vertical movement or elevation of the sight slide. By this arrangement a nice adjustment may be calculated to the fraction

Fig. 184.—The Westley Richards Detachable Barrel, with Patent Locking Lugs, is secured in position by the method illustrated.

At the end of the fore-end is shown the steel ball or boss, which rides upon a spiral spring; on turning the barrel about a quarter turn the steel boss is pressed within.

of an inch, instead of to several inches, and in a rough-and-ready way as provided in other constructions of sights. The latter condition prevails with all European rifles, so that when the experienced marksman in long-range target shooting is desirous of adjusting his elevation to a more minute degree, he has to make use of a separate instrument called the "Vernier," carried in his pocket. This involves some little trouble and delay, but no marksman worthy of the name, in this country at all events, would think of entering into a competition without this vernier, and, indeed, without it no first-rate marksmanship is to be achieved.

Westley Richards have given considerable attention to this important branch of rifle-shooting, and for the first time have produced practical wind-gauge and vernier sights for attachment to their rifles which fulfil the military needs of strength and simplicity, and at the same time form great aids to marksmanship.

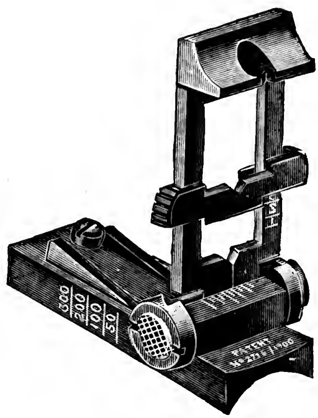


Fig. 185.—Pivot Wind-gauge Sight.

The mechanical principles of these sights are fully described in Chapter XI. It now only suffices to say that these improvements, so necessary for the military weapon, have wisely been adapted to the Sherwood miniature rifle. The Mark I Sherwood rifle is fitted with the ordinary tangent back-sight, but the leaf or tangent of this sight is capable of lateral movement across its bed. By pushing on the pivot the leaf is moved across for wind-gauge allowance. On closing down the leaf it automatically centres itself and returns to its original position, *vide* illustration above. This is extremely simple, and easily understood and manipulated.

Mark II Sherwood rifle is supplied with the wind-gauge and vernier elevating sight. The motion of the wind-gauge is the same as on the Mark I, but the pivot is moved across by a screw worked by the milled head, which gives a more accurate adjustment, such as is frequently needed when at the target.

A further arrangement, securing accuracy of wind-gauge adjustment, is provided in this sight. The milled head is divided into six notches, and, on turning the head, a spring "snicks" into a notch, each notch represents half-an-inch of lateral allowance upon the target, which is conveyed to the marksman by the sense of touch and through the ear, without troubling him to read the scale. This sight is a vernier in itself, dispensing with the separate vernier hitherto carried in the pocket. By turning the head of the screw fitted at the side of the tangent leaf, an adjustment may be obtained of half-an-inch up and down. As a rule one inch represents the minimum allowance of elevation, and the scale may be divided into $\frac{1}{150}$th of an inch, a measurement equalling one inch for each 100 yards.

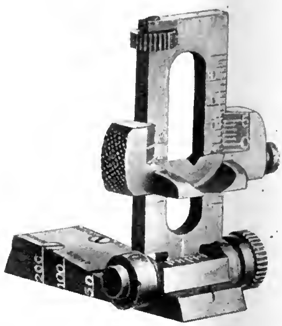


Fig. 186.—Vernier and Wind-gauge Sight.

Some marksmen prefer a peep sight, and Westley Richards have also applied to this sight the pivot wind-gauge screw movement for lateral movement of the sight to correct the effect of the wind. This sight also has the micrometer arrangement of notches, as described above.

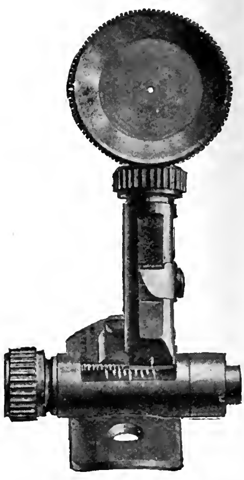


Fig. 187.—Wind-gauge Peep Sight.

The National Rifle Association regulations for the Bisley meeting, 1906, concede the use of wind-gauge or laterally adjusting back-sights in both Miniature Rifle Competitions, Class A, and also in the Military Miniature Competitions, Class B. This is a step in advance.

This new regulation is not solely for the purpose of wind-gauge, it is more for the object of enabling the shooter to correct any error of sighting, either due to the construction of the rifle, to the operation of wear, or to faulty holding and aiming on the part of the marksman. This narrow and restricted use of this laterally moving sight is confined solely to the Bisley meeting; in reality, the new regulation is a great stride, and opens up a field of promise for the cultivation of marksmanship amongst civilian clubs. In those clubs where shooting is conducted at longer ranges than 100 yards, advantage will be taken of the wind-gauge sight for use to correct the deviation of the bullet due to the wind, and it is to be hoped that, as a natural sequence, the National Rifle Association will extend the range for miniature rifle competitions, which the permission to use the wind-gauge sight renders all the more practicable.

Since the principle of the wind-gauge sight in its fullest and most practical aspect is admitted to be necessary upon the service rifle, rifle shots may be permitted to hope for this much-needed change in the regulations concerning miniature rifles.

N.R.A. REGULATIONS.

Ammunition for Indoor Shooting.

With a bullet not exceeding 80 grs. in weight, observed velocity must not exceed 1200 feet per second over 20 yards. Energy equivalent to 222 foot-lb.

With a bullet exceeding 80 grs., not exceeding 100 grs. in weight, observed velocity must not exceed 1000 feet per second over 20 yards. Energy equivalent to 256 foot-lb.

Ammunition for Outdoor Shooting.

Weight of bullet, maximum, 140 grs., observed velocity 1450 feet per second over 20 yards. Energy equivalent to 652 foot-lb.

The conditions laid down by these official regulations approximately reproduce the ballistics of the Westley Richards Sherwood rifle.

It will, further, be noted that ·32/40 cartridge is excluded from the miniature classification, as far as Bisley is concerned.

Mr. Greener's club rifle is made in a variety of patterns for target use and for sport. It has been used with satisfaction at small deer in India.

Fig. 188.—Sherwood Miniature Match Target Rifle.

The Westley Richards Sherwood rifle is made in the following models—

Mark I.

1. The Sherwood club rifle, Mark I, with patent push-pivot wind-gauge back-sight. Detachable barrel and action in two qualities.

2. As above, but with fixed action.

3. As above, but with fixed action and ordinary tangent sight and detachable barrel.

Mark II.

1. The Sherwood club rifle, Mark II, with patent pivot wind-gauge back-sight and vernier elevator combined. Patent detachable barrel and action in two qualities.

2. As above, but with fixed action.

3. As above, but with fixed action and ordinary tangent sight and detachable barrel.

Each of these eight models may also be had in a variety of bores for well-known cartridges of established accuracy, such as the ·22, the ·297/·230, ·250, and ·300 rook-rifle cartridges; as well also the ·32/40, a most excellent cartridge. Weight of bullet, 185 grs., nickel base; muzzle velocity, 1440 feet per second.

The Sherwood is also made as a miniature match target rifle with attachable peep-sight collar fore-sight with three interchangeable discs of different sizes, and fixed spirit-level, chambered for the Sherwood or the ·32/40 cartridge. (Illustrated as on p. 338.)

The Westley Richards under-lever sliding-block rifle, chambered for the Sherwood cartridge and copper-capped expanding bullet for sport, with Axite powder.

With regard to accuracy, the Greener club rifle, the Sherwood, and the ·32/40, have distinguished themselves at Bisley. The ·32/40 is, however, a rifle that fairly may be considered outside the miniature rifle question.

Last year at Bisley the Greener and the Westley Richards Sherwood rifle both obtained highest possible scores at 100 yards in the Miniature Rifle Competition.

In 1904 the Sherwood rifle won the Miniature Rifle Competition with a highest possible, both this diagram and the target made in 1905 being shot with a Sherwood rifle which had been in use for a year or two. In 1904 it had already shot 3000 cartridges, and last year (1905) over 4000 cartridges had been fired from the barrel, a striking testimony not only to accuracy, but to the lasting qualities of the barrel. At the Bisley meeting in 1903, in the Sherwood Competition, the winning diagram made by the Westley Richards rifle showed, out of seven consecutive shots, six consecutive in a space of $1\frac{1}{8}$ by $1\frac{3}{16}$ inches.

The championship of the Leamington Rifle Club has been won for two years in succession by a Sherwood rifle. In 1903, the winner, Mr. Barr, out of 81 shots, giving a possible of 420 points, scored 403. On one occasion he made a possible of 35 at the distance of 350 yards, making a total of 103 at 100, 200, and 350 yards, out of a possible 105; and on two other occasions he dropped only one point at the 350 yards range. With such a high standard of accuracy at the longer ranges, which have been confirmed by the use of the weapon under sporting conditions, it is inconceivable that the Bisley authorities still refuse to provide competitions for miniature rifles beyond 100 yards.

Even the ·22 long rifle cartridge shoots accurately to 200 yards, but has not the steady and reliable flight of the heavier projectiles recommended. The advantage of practising long-range shooting in civilian clubs is that the youths are early trained to accustom their eyesight to aim at comparatively long ranges. The eyesight forming such an important factor in rifle shooting, the longer the range under reasonable practical conditions, the better.

More efficient marksmen would result from a course of shooting which had been carried on at from 200 to 500 yards than could be possible with competitions conducted at 100 yards range or thereabouts.

Introduced primarily for target purposes, the modern British miniature rifle is, nevertheless, a satisfactory sporting weapon within limits. The use of cordite and Axite powders, which permit a comparatively high velocity with remarkable accuracy, has made these simple-looking weapons of greater ballistic value than their prototypes of the past. They are, in a word, endowed with a degree of effectiveness which only larger and more powerful weapons could formerly lay claim to.

It is only to be expected that these improved qualities would appeal to sportsmen, who welcomed the advent of a rifle so light, neat, and handy, and yet so accurate and deadly. The deadliness or effective killing power is further increased by the use of new bullets, which, as it happens, have been introduced almost coincidently with this modern system of miniature rifle.

Elsewhere I have fully described the capped bullet system. The Sherwood cartridge has, during the last two years, carried a compound bullet, covered with nickel at the rear end, also one having a copper nose or front upon the capped system. The latter form shoots with extreme accuracy, and the expansive qualities have proved to be of a very high order, and are spoken well of by all who have used this system of bullet in actual sport.

Messrs. Westley Richards have, therefore, recently introduced a double-barrelled rifle, rifled and sighted for this sporting cartridge, which they call the "Double Sherwood." It weighs from 6 to 6½ lb., has perfect balance, and although recommended for deer shooting of the smaller kind, some very good shooting has been done with it at stags weighing as much as 231 lb., and even bigger species have been brought to bag by this little weapon.

Another pattern of miniature rifle for sporting purposes is the

Minex, which has just been introduced by the firm of Westley Richards. It is constructed on similar lines to the Sherwood, but is ·298-bore and is chambered for a bottle-necked cartridge instead of the straight taper Sherwood pattern. Another and important difference lies in the bullet adapted for this new cartridge. It is of the nickel-base lead pattern, but with the nose end surmounted by a hollow brass or copper cap similar to that employed in the Explora or Fauneta bullets. The Minex bullet is especially adapted for sporting purposes at deer, black buck, cheetul stag, and like game, and possesses remarkable expanding qualities.

The following particulars convey some idea of this miniature express sporting rifle—

Weight of double Minex rifle, $6\frac{1}{4}$ to $6\frac{1}{2}$ lb.
Weight of single Minex rifle, $6\frac{1}{4}$ to 6 lb. 10 oz.
Length of cartridge case, $1\frac{3}{8}$ inches.
Weight of bullet, 140 grs.

As some people might be inclined to question the effectiveness of this weapon, I have given in Chapter XV a few reports received from Scotland, and I here give others, confirming these results, from British Columbia and India—

"I may mention that with your Sherwood rifle I have shot black buck, and find your copper-capped bullets excellent. My wife has also shot two small cheetul stags with it."—Lieutenant-Colonel D. M.

From British Columbia—". . . The caribou which I shot at 220 yards with the Sherwood is the *largest* bag secured with a rifle of such a bore."

With a party outward to Nicomen, B.C.—"Our party has had at least passable sport along this game-frequented range, there's plenty to shoot, but as our time is so limited we are unable to follow far. The bag up to date is ten bears, two mountain sheep, big horns, and a number of deer. The Sherwood ·300 accounted for four black bear, one big horn, and a number of smaller game."

The high standard of accuracy is, of course, a great factor of efficiency, enabling the sportsman, as it does, to place his shots in a vital spot with certainty; but accuracy alone would not have enabled such a small-bore weapon, having a medium velocity, to bag game so successfully, were it not for the superior expansive qualities possessed by the copper-capped expanding bullet.

Frequently rifles, all too-powerful, are adopted for small deer, the high-power Mannlicher and Mauser rifles to wit. These weapons shoot bullets giving extreme penetration, owing to their high velocity and lack of expansion. The ·256 Mannlicher, I know, is considered by some sportsmen unsuitable for chamois shooting, as it does not always kill, and it is probable that both for this sport and for ordinary deer-stalking at average ranges, a lower velocity weapon shooting a bullet of greater expansive quality would be more effective. It is, I consider, on account of these qualities that the Sherwood rifle has proved so successful.

There is another recommendation for these medium-power small-bore rifles, and that is, that in a limited stretch of country shooting can be conducted with greater safety. From time to time one hears from sportsmen who use a Mauser, a Mannlicher, or a ·303-bore rifle for deer in thickly-populated India, that villagers are occasionally shot by users of these long-range weapons; and these same weapons are also used for park deer at home.

Unless shots are taken against a fairly high background, the use of such weapons becomes dangerous, and, what is more, complaints are made that their bullets often pass clean through the object, allowing the beast to travel a considerable distance before dropping. This can only be expected from such conditions, namely, the high penetrative character of the bullet and the lightly-built animal against which it is used.

It does not, of course, take much to bring down deer of the smaller size, say of the fallow deer type and weight, and indeed the latter have been shot with a Mauser pistol; although when properly hit with the solid and ordinary soft-nosed Mauser pistol bullet the animal is not immediately stopped. The Mauser bullet weighs 80 grs., and has a muzzle velocity of 1400 feet per second. Sir Bryan Leighton, in the year 1899, wrote to Messrs. Westley Richards that he had found the Mauser pistol when used with the all-range Mauser bullet to be effective, as the following particulars show—

"He had previously condemned the Mauser *soft-nosed* bullet, as he found it only wounded the animals without stopping them. He fired a first shot at 60 yards, but as the deer went on he was at first under the impression that he had missed, so he fired another shot at 45 yards, after which the deer went on another 20 to 30 yards, and then fell. Finally, at a distance of 10 yards a shot was fired at the neck for experimental purposes. The shot which entered the shoulder was found to have penetrated the heart, making a hole through it about seven-eighths inch in diameter, and smashing a rib in two pieces with a hole of about the same size. The nickel then separated from the core. The shot in the neck passed right through to the other side and lodged just under the skin, with two small pieces of lead, weighing a few grains, detached. This bullet met the bone of the neck, shattered it, and mushroomed perfectly, having lost in the process only ten grains." Sir Bryan Leighton expressed himself as perfectly satisfied with the bullets, and considers the result gratifying.

But the all-range Mauser pistol bullet is far less effective than the capped bullet, as my own extended trials have shown.

The Sherwood bullet, it will be remembered, weighs 140 grs., having a muzzle velocity of 1450 feet per second; the weight of the bullet is, therefore, nearly twice as much as that of the Mauser pistol bullet, which has proved satisfactory at fallow deer. From this interesting comparison we are better able to realize the effectiveness of the Sherwood, not only at the smaller, but even at the larger kind of deer.

It is certainly a fact that in India rifles of a power far beyond the necessity of sport are sometimes used. I have heard of high velocity ·450 express rifles being used against black buck. The average weight of this beast is 85 lb., therefore conceive the effect of a ·450 bullet possessing a striking energy of 4900 foot-lb. Doubtless this was not a weapon taken from choice; the sportsman was probably after more dangerous game, and happened to come across the smaller animal. Such a lightly-built animal, however, would be better pursued with a Sherwood rifle, or one of a similar description, and for shooting this kind of game in India, Africa, New Zealand, South Africa and Canada, I do not think one could have a more reliable weapon when used with the copper-capped expanding bullet.

Messrs. Cogswell & Harrison are responsible for the introduction of the Certus rifle for miniature target shooting. It is constructed to shoot the ·22 rim-fire short and long cartridge, and is a single-loader with a bolt-action. The shoe which carries the bolt and trigger mechanism is fixed to the barrel; the stock and fore-end are of one piece, and the barrel and shoe, together with the bolt, can be readily detached from the stock by the removal of a pin, which enables the shooter to pack the rifle away in a small compass. Of simple construction and low price, we cannot apply too stringent a view to the workmanship. On the whole it is an efficient weapon, and as far as concerns low-priced small-bore miniature rifles, the Certus is probably one of the best of its class. There are several patterns of sighting. The standard pattern consists of an upright strip of metal, which works in two grooves fixed in a bed upon the barrel, and is lifted up and down for the different ranges, which are marked upon the front. The sight is made with a "V," and is held rigid by means of a pin.

This method of sighting equals anything that is applied to American and Continental weapons, but it falls below the best British efforts in this connection.

Among the earlier types of American miniature rifles introduced into this country for target purposes, was the single rifle known as the Ballard. This had an under-lever falling block-action, the block being actuated by the under lever. The lock mechanism was cocked separately by hand. It was constructed to shoot either the ·22 rim-fire cartridge or a ·22 central-fire cartridge, known as the ·22 Winchester, which fired 14 grs. of powder and 45 grs. bullet, shooting with considerable accuracy up to 150 and even 200 yards.

Almost concurrently with this weapon, both the Winchester single-shot rifle and the Remington single-shot rifle, ·22-bore, were introduced here. They were regulated either for the ·22 short rim-fire cartridge or for the long ·22 central-fire cartridge mentioned. These constitute the American single-shot miniature rifles in vogue in this country twenty years ago.

About that time the Colt and Winchester Companies placed before the British sportsman their repeating rifles for the ·32, ·38, and ·44 calibre cartridges. The ·32 calibre shooting 20 grs. of powder and 100 grs. bullet in either pattern weapon shot with considerable accuracy up to 200 yards and more.

Some little time subsequent to this the Marlin Company introduced rifles shooting this cartridge as well as other sizes.

Amongst others was a repeating rifle shooting a ·25/36 cartridge. This was a bottle-necked central-fire cartridge, the bullet of ·250 calibre, shooting 23 grs. smokeless powder and 117 grs. bullet, an exceedingly accurate cartridge up to 500 yards. This firm also introduced the ·300-bore cartridge, with a long bottleneck, known as the ·33/·30 smokeless; charge 29 grs. smokeless powder, 160 grs. bullet. This was quickly followed by a ·320 calibre cartridge known as ·32/40, also accurate to 400 or 500 yards.

Magazine rifles at the best are not ideal target weapons, the cartridges occasionally get damaged in passing from the magazine into the chamber; besides this, the balance of the rifle is disturbed at each shot, which is not conducive to the highest accuracy.

Amongst modern American rifles enjoying considerable popularity in this country is the Stevens ·25 rim-fire rifle. This cartridge is accurate enough to 200 yards; its charge is 11 grs. of black powder and 65 grs. bullet. This weapon is constructed on the sliding-block principle, having an under lever to work the block, as well as to effect the cocking of the arm. It has a detachable barrel, although on a crude system, and can be packed in a small compass. Owing to its low price and portability, and shooting cheap ammunition, this weapon undoubtedly assisted in popularizing miniature target shooting.

Another pattern of rifle by the same maker has a longer barrel, and weighs from 2 to 3 lb. heavier. This is known as the "Ideal" rifle.

During the last twenty years the Remington Arms Company have sold a large number of their single-shot rifles in this country. They were bored for the ·22 rim-fire short and long cartridges.

There are now supplied amongst modern American rifles the Stevens, Winchester, Savage, Marlin and others, as well as rifles of Belgian manufacture, all shooting the ·22 rim-fire cartridge for gallery or indoor shooting. Such weapons have long been in use at the shooting-galleries of country fairs, and if their capabilities are to form the standard, the travelling caravan may be regarded as the pioneer of civilian rifle-shooting.

Weight of Stevens' Favourite, ·22 short	$4\frac{1}{2}$ lb.
,, ,, ,, Ideal, English model, ·22 short	$5\frac{3}{4}$,,
,, ,, ,, ,, American match, ·22 short,	7 ,,
,, ,, Winchester single-shot, ·22 short, from ...	$4\frac{1}{4}$,,
,, ,, Savage Target Rifle, ·22 short, from ...	$4\frac{3}{4}$,,

The War office has produced its own model of miniature rifle, of which I understand the bolt, fore-sight protector and back-sight are all of Government design. The other items have been selected from six competing models which were submitted by gun manufacturers, whose sole reward, I am informed, lies in the honour of contributing ideas which are regarded as unpatentable combinations. Had these gunmakers been responsible for the whole effort, they would not have had much to boast about.

This miniature rifle is very much on the lines of the American small-bore rifles, already alluded to and so familiar here during many years, having the same pitch of rifling, and shooting an American cartridge of ·22-bore.

This Government miniature rifle is on the bolt principle.

Length of barrel, 24 inches.
Length over all, $41\frac{1}{2}$ inches.
Weight, 5 lb. 5 oz.
Bore, ·22 for long cartridge, rim-fire.
Charge of powder, 5 grs. semi-smokeless.
Weight of bullet, 40 grs.
Length of cartridge, $\frac{31}{32}$ of an inch.
Length of case, $\frac{39}{64}$ of an inch.
Weight of cartridge, 55 grs.

It is sighted to 200 yards, which is an extreme range for the long ·22 cartridge, and is principally intended for indoor use at 25 yards, and also for shooting up to 100 yards, in this respect confirming the mistaken policy adopted by the National Rifle Association with regard to the range for miniature competitions.

The best feature of the weapon is the back-sight. It is of the flap-up pattern similar to the new service sight, and has a wind-gauge bar, though of an antiquated pattern. The Westley Richards sight of this pattern is far superior and of more mechanical construction.

This new Government weapon has not yet been subjected to a thorough test, but it may prove successful within its limit. If produced cheaply, it may have a demand, but the civilian who takes rifle-shooting seriously is more likely to prefer one of the superior rifles of large calibre and longer range which I have described.

In a small but very instructive pamphlet, entitled *The Art of Shooting with the Rifle*, published in 1888 by the late Sir Henry Halford—who gave a life-long devotion to the art of rifle-shooting—we read at the conclusion of his work—

"I shall be well repaid for my trouble if I can induce one Englishman to become a rifleman. Believe me, the use of the rifle is a sport in itself. More than that—and far more—the rifle of the present day is the long-bow of the middle ages. If the youth of England could use the rifle, the strength and power of the United Kingdom would be invincible."

When this experienced rifle-shot uttered these words, he was only foreshadowing what we all hope may be the outcome of the civilian rifle movement.

As a long-range shooter we may be sure that he would have had little or no sympathy with the feeble methods of teaching rifle-shooting now in vogue. The long-range rifle doubtless is, as he says, the equivalent of the long-bow of the middle ages, but many of us would have expressed surprise if we had learnt that our ancestors taught their youth the use of the long-bow by means of a catapult, which would be no more ineffectual for their purpose than the air-gun and the ·22-bore are for our modern requirements. Even with the long-bow good practice was made at 300 to 400 yards, and it strikes one as somewhat of a retrograde movement for the youth of England in these times to have their tuition confined to short-range shooting.

As stated in the retrospective chapter, the laws enacted in the reign of King Henry VIII. demanded that every able-bodied man should be trained in the use of the long-bow. But these laws further insisted that shooting should not be conducted at shorter ranges than 220 yards under a penalty. In the statutes of the reign quoted concerning the practice of shooting, there is a provision forbidding shooting at a standing mark, except for a rover, by which is meant snap-shooting, when a less range was permitted, but even in this case a change of target was compulsory at each shot.

Notwithstanding the great progress made in the construction and capacity of fire-arms, by which their use has become effective to a mile or so—more than trebling the effectiveness of the long-bow—nevertheless, modern authority endorses the policy that under the requirements of an increased range, three times greater than that of the long-bow, marksmanship is to be taught and acquired by practice at one hundred yards out of doors, and but a stride or two away within doors. And this to those individuals who will some day, perhaps, be called upon to handle the long-range modern rifle, and expected to be proficient in its use at a mile or more. Our ancestors well knew that proficiency in marksmanship, even though the range of the firing apparatus were limited to 400 yards, could not be taught or acquired at a less normal range than 220 yards.

A word should be said about the sighting of the American rifles as compared with the sighting of English rifles.

It is well known that in America rifles are made throughout by machinery; there is no handwork on them, and in many instances builders of rifles do not make their own sights. They obtain them from a company which confines its attention to making all kinds of sights, and turns out both back- and fore-sights by the thousand. The requisite slots are made in the barrels of the rifles by the rifle-makers, and in the assembling of the machined parts after they have been blacked and hardened, the sights are knocked in.

The rifles are constructed to shoot straight, but the fine adjustment of the different distances is left to the shooter to arrange, and we have always considered this a great drawback in American rifles. Instead of following their rough-and-ready method of sighting, makers in this country regard the sighting as being second to no other process in the construction of the weapon, and each target rifle made by a trustworthy firm is carefully graduated and sighted and shot at individual ranges which are marked on the sight, thus saving the shooter considerable time and expense, besides giving him a guarantee that the rifle has been tested and shot for accuracy by an expert.

In the matter of sights the English gunmaker is undoubtedly far ahead of his American competitor.

We have seen a number of wind-gauge sights patented and made in America, but we have never yet seen one that we have considered worthy to be put on a rifle with any pretensions to fine workmanship. There are perhaps two sights in America that are deserving of praise, those are the two sights extensively made by the Lyman Company, generally known as the Lyman combination rear-sight, fitted on the butt of the rifle, and the Beech combination fore-sight. These two peep sights in conjunction are undoubtedly a boon to target shooters, and have considerably increased the possibilities of scoring. But, to be quite fair, we may point out that both the principles of these sights were in vogue in England years before America dreamed of making rifles or sights.

This subject would not be complete without reference to the modern air-gun or rifle. For the want of better practice out of doors with a rifle of effective range, a large number of our citizens, to whom the late Lord Salisbury's appeal was especially directed, have enthusiastically taken up air-rifle shooting within doors. It may not be much, but it is something towards the increase in the interest all good citizens desire to have taken in this question, and it is difficult to suggest a better solution of the problem which has (1) to adapt its needs to smaller rooms than are suitable for longer range work; (2) to deal with a class of people whose occupations prevent them from daytime practice; and (3), perhaps the most important factor of all, viz. to provide weapons and ammunition that will permit this recreation to be enjoyed at an infinitesimal cost.

It is, at all events, a nursery ground for the elementary training in marksmanship, which may inculcate an interest and a larger and more serious attention to the question of practical outdoor rifle shooting. Many of the air-gunners practising in small rooms to-day may become the practised and proficient rifle shots of to-morrow. This question has, therefore, given a great stimulus to the makers of air-guns. A few years ago the air-gun was but a toy, whose use was confined, for the most part, to the genus boy. Upon the formation of air-gun clubs, greater accuracy was found to be necessary. The ordinary smooth bore represented by the then existent air-gun, of which the Gem pattern was one of the chief exemplars, was not accurate and reliable. Thus an opening was provided for the production of an improved weapon, and the opportunity was seized by several gunmakers to introduce new weapons of improved utility, and bored and rifled accurately in order to make shooting more interesting, and therefore more instructive.

Perhaps the best of these air-rifles is that manufactured by the Birmingham Small Arms Company. The length of the barrel is $19\frac{1}{2}$ inches, and it does not break down in order to load, as in the old Gem pattern, but is fixed. The weapon is cocked by a separate lever, which is situated underneath the barrel. As this lever is pulled down, the spring operating the piston is compressed, and the arm is cocked. The pellet or slug is inserted in the following manner: A taper plug passes through the barrel at its junction with the air-piston chamber. This plug is turned round by a short external lever on the left side of the weapon, until it is clear of the pellet chamber. After the pellet is inserted, the plug is turned back again, carrying the pellet with it.

The makers claim that the plug and fixed barrel have great advantages over the break-down system. There is this disadvantage however, as constructed, the operation of loading is slow, two more operations are necessitated by this separate plug movement than in the break-down system. The operations are as follows—

1. Opening the lever placed underneath the barrel.
2. Closing the lever placed underneath the barrel.
3. Turning the external lever and plug in order to expose the loading aperture.
4. Placing the pellet within the aperture for entry within the chamber.
5. Turning back the lever to close the aperture.

Messrs. Westley Richards have shown me an improvement upon this system which obviates the objection of slow loading in this B.S.A. rifle. It consists of an attachment between the arm of the cocking lever and the external plug, which we have seen has to be moved separately and independently. By this attachment the depression of the lever causes at the same time the plug to turn, and thus in two movements is done what the original arrangement required four to accomplish. This system is very cheap, and has the additional advantage that for an insignificant price all existing rifles of the old type can be fitted with this attachment, which can be easily fixed by the owner upon his air-rifle. Further, the rifle may be used, if desired, without this attachment. The saving of mechanical operations in manipulating these air-rifles will, however, I think, appeal to the majority, and if this be so, future supplies may be manufactured with this external loading system provided as a fixture on each weapon. This will enable the manufacturer to abolish the upright extension of the loading plug, which is an objectionable and unsightly feature of the present air-rifle.

The barrel of this rifle is bored ·177 inch in diameter, and is rifled with shallow poly-groove rifling, which is found satisfactory for the accurate driving of the leaden pellets.

The weight of rifle is about 7 lb. and the point of balance is $6\frac{1}{2}$ inches forward of the trigger. The stock is supplied in three lengths, $13\frac{1}{4}$, $13\frac{3}{4}$, or $14\frac{1}{4}$ inches from the trigger to the centre of the butt. The back-sight gives a maximum range of elevation of $\frac{1}{10}$ inch, is $11\frac{1}{2}$ inches forward of the trigger, and compares favourably with the ·303 rifle in this important point.

The sights are of a varied design. Some people advocate laying down a definite pattern of open sight for use by the affiliated air-rifle clubs. This is to be deprecated, and marksmanship is much more likely to be learnt by individual experiments with a range of sights than by a rigid adherence to one pattern, which cannot possibly suit all individual needs. The rifle is interchangeable, so that worn parts can be readily renewed.

The best slugs or pellets for these weapons are manufactured by Kynoch, Ltd. There are two varieties, the "Match," weighing 10 grs., and the "Witton," weighing 8 grs. The "Match" is considered to be the most successful design.

The "Britannia" air-gun, of same calibre, is another pattern which finds favour. It is an improved form of the Gem type, with break-down barrel, and is supplied by all gunmakers.

Although it can scarcely be said that marksmanship can properly be taught within doors, there is no doubt that many points of elementary instruction may be there acquired by the beginner. The Morris tube has helped in this direction, but its ranges and general equipment are expensive. Now that efficient air-guns built upon practical lines have been introduced, I believe that they will be more and more used in the Volunteer and regular corps, in place of the Morris tube. They have this advantage, that they are suitable for the particular elementary kind of training referred to, such as aligning the rifle, bringing up the weapon to the shoulder, and snapping off within a given time; and so enable the shooter and instructor to quickly ascertain the results of errors.

Messrs. Westley Richards & Co. have shown me an air-gun with fixed barrel, of a type already described, attached to the breech action and stock of a British Government service rifle. This arrangement retains the service weight of the rifle, its length of barrel, the external shape, form, and dimensions of stock, and the same trigger and guard and magazine, so that the handling of this combination air-rifle is the same as the service rifle, which is of great importance in the training of recruits.

One other matter, which is perhaps of greater value, is that it enables the same form of back-sight and fore-sight to be employed as on the service rifle.

These sights having the same radius, give the same angle in

WESTLEY RICHARDS'S PATENT COMBINATION AIR-GUN AND SERVICE RIFLE: SHOOTING PRONE POSITION.

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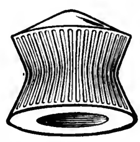
sighting as the service rifle, and are, therefore, of the same value at any range; a recruit having learned to snap-shoot with this weapon and to estimate the exact value of any error in sighting at a distance of seven yards indoors, has nothing to unlearn when he takes the same weight of rifle with its other conditions for outdoor longer ranges. And so equipped with these rudimentary instructions, he can now proceed to the serious business of learning to shoot.

Since writing the above it is gratifying to note that the Army Council has given official recognition to the Society of Miniature Rifle Clubs, and agrees that the Society shall have equal powers and be accorded privileges similar to those now enjoyed by the National Rifle Association.



KYNOCH SLUG
FOR AIR-GUNS.

CHAPTER XIV

GUN FITTING—THE TRY-GUN AND ITS USES—STOCK FORM AND MEASUREMENTS—SECOND-HAND GUN BUYING

OCCASIONALLY one hears of men who can shoot well with almost any gun, but with the majority of sportsmen how different is the case, for to them a properly-fitted gun is of supreme importance. This chapter will, so far as possible, show the points to be considered in constructing the stock of a gun to suit the physical and other requirements of the man who has to shoot it.

The introduction of the shooting-ground and the firing adjustable try-gun, has done much to facilitate the business of the gunfitter, but there is the imperative need still for the employment of the highest skill and knowledge he can bring to his aid. On the introduction of the try-gun, some gunmakers, failing to appreciate its limitations, were prone to ascribe to it the wonderful powers of an automatic "fit-finder," and many absurd blunders resulted. In short, the servant became the master, and although at that time the try-gun was a crude affair, they preferred to regard it as infallible rather than take heed of the rules and lessons that years of experience should have taught them. Even now, improved as it is, the operations of the try-gun must be carefully watched by an experienced fitter. Without this practical superintendence, accurate results in the shooting field cannot possibly be expected.

There are two distinct methods of aiming with the shot-gun at moving objects : (1) The one-eyed deliberate or dead-bead system, and (2) the two-eyed instinctive pointing of the gun in the desired direction. In the first, one eye rigidly aligns the rib and sight of the gun upon or in front of the object. In the second, both eyes, whilst wholly riveted upon the quarry, instinctively assist in bringing the gun to bear in the desired direction. In a general way, with people of normal vision using guns of good fit, the first mode is the slower and less certain, the latter the speedier and more effective method of aiming.

It has been asserted that it is manifestly impossible for both eyes to take aim at the same time, and that when shooting one eye alone should dominate the movement of the barrels. If this be admitted, the first question to decide is: Which eye is to do this? Unconsciously, in testing a straight-edge one eye is neutralized and the other used by every one, the same when taking deliberate aim along a gun-barrel at a fixed object. But in any case, should one eye be the stronger, that eye is the master eye.

Although it is generally safe to assume that the eye used for testing a straight-edge would be the one used for aiming, when in the shooting field it is not always the case, and there seems no simple method of determining the question as to which is the master eye, except by actual trials with a firing gun adjustable to both eyes.

In theory, the ideal method of shooting would be to use one eye and cover or shut the other, but in practice this is unsatisfactory, as it is next to impossible to judge distances with one eye only. A simple experiment will illustrate this; place two pins one a little behind and on one side of the other, a good distance off on a smooth surface such as a billiard-table, and on glancing with the eyes level with the surface, the pins appear to be abreast of each other if one eye only is used, but with both eyes open their actual position is immediately evident.

Some men appear to be physically incapable of keeping both eyes open when aiming a gun. In my opinion the utmost proficiency in shooting with the shot-gun—*i. e.* speed coupled with certainty of aim—is attainable from the use of both eyes. Even those good and careful shots who from habit shut one eye, might even excel their present form were they to keep both eyes open. I think that the true secret of the highest success in killing moving game with the shot-gun, and in much the same degree with rifle also, is a due observance of the following rules—

1. Keep both eyes open.

2. Look steadfastly at the object and nothing else.

3. Think steadfastly of the object, avoiding all thought of the gun, of the sight upon the rib, or of the background against which the game is configured.

4. On no account alter the focus of vision from the objective to the gun-sight in an attempt to bring the latter to bear upon or in front of the former; the moment this is attempted the gun is involuntarily stopped and the quarry wins the race.

Whilst the dimensions of the gun-stock are of immense importance to the shooter, we find that, as a rule, he is satisfied to leave these measurements to his gunmaker. The question of fit has, however, become so prominent during the past decade or so that there has grown and is still growing a great interest in the matter, and sportsmen are evincing the desire to know exactly in what way the gun expert arrives at a proper fit. In order to do this, he will have to set aside the idea that the dimensions of the stock, because elementary in character, therefore become simple to attain.

Roughly speaking, the stock consists of three principal measurements—length, bend, and cast-off. Each one of these, whilst simple in form, is complicated by extensions of the principle governing it. Thus, we have three points governing the length; the bend has to be taken at two points, while the cast-off, though usually measured at the bump and also at the toe, becomes the more complex when its measurement is taken from the comb.

In addition to these, we have measurements of a much simpler nature to consider, but upon which a great deal depends in order to secure a proper and correct fit with perfect control and ease of handling the gun under all varieties of shots. These measurements consist of the size and shape of the handle or grasp, the length of the handle to the point of the comb, the grip of the stock being made to suit the hand for which it is intended, remembering that if the hand is large the thumb-hole must be of proportionate length and depth, to prevent the thumb protruding above the comb. The form and size of this comb, and finally of the thickness, depth, and shape of the whole stock, matters which are included in that comprehensive but indefinable technical term "make-off." It is to this quality that a gun owes that smoothness and ease of handling which especially distinguish those high grade weapons upon which the finisher at the expenditure of much patience has devoted hours in making-off the stock.

And when properly made-off by a workman who loves his work and approaches it in the spirit of an artist, all who appreciate a fine gun will recognize that he has pervaded it with a character so subtle that it can only be expressed by *je ne sais quoi.*

Possibly it will be of interest to examine each principal measurement seriatim.

First, the stock-length. This is usually measured from the front trigger, or in the case of a one-trigger gun from the trigger,

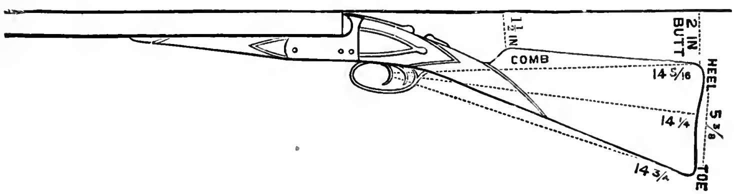


FIG. 189.—TO TAKE THE MEASUREMENT OF A GUN STOCK.

Take a straight-edge sufficiently long to reach from the end of the barrels to the end of the butt, lay it straight along the top of the rib of the barrels and over the butt, measure up from the butt by the heel-plate, and from the comb or ridge just behind the grip, which will give the bend of the stock. The lengths should be taken from the fore-trigger to the edge of the heel-plate.

An ordinary gun measures—

$1\frac{1}{2}$ inches at comb
2 inches at heel } for bend of stock.

$14\frac{1}{4}$ inches from the fore-trigger to edge of heel-plate centre
$14\frac{5}{16}$ inches from fore-trigger to edge of heel
$14\frac{3}{4}$ inches from fore-trigger to edge of toe } for length.

Depth from toe to heel, $5\frac{3}{8}$ inches.

Cast off, about $\frac{1}{4}$ inch.

to the end of the butt at three points, viz. the bump, the centre, and the toe, as here illustrated and described.

In Chapter III has been discussed the question of length and in what way it influences the shooter. It is a common belief, shared, too, by many gunmakers, that so long as the length be taken from the trigger, measurements of equal register at the points named give the same results in practice, and are in fact identical. But this is not the case, unless the trigger occupies the same position relatively to the breech end of the barrel, and further, relatively both to the right hand which grasps the stock and to the left hand holding forward and supporting the barrel. This length of stock affects the shooter in two ways. In the first place, the measurements from the trigger virtually give to his right arm and shoulder that measurement of stock, which permits him to bed the stock comfortably at his shoulder, and when in that position to reach the trigger with his pulling finger. But, after all, this is subservient to the position at which the left hand grasps the barrel.

We all know the falsehood of extremes. To hold the left hand too far away from, is as objectionable as holding it too near, the trigger-guard. A shooter who holds at the end of the guard is depriving his left arm of its power to fully assist in moving the gun. He is usually a slow, poking, and ungainly shot. The man who holds too far forward not only puts his left arm to a strain but hampers its free use and so impedes the movement of the gun, particularly at overhead shots, whilst at crossing shots this, by lessening support, causes the muzzle of the gun to drop. Therefore, by all means hold forward, not at the fullest stretch, but leaving the arm in a natural unstrained position. This will give the greatest support to the gun, and permit of the freest movement at all kinds of shots, whether up or down, right or left. If supposing a man having a length of stock which he can comfortably manage with the right arm, holds with his left arm just in front of the trigger-guard; then should he adopt a different method and hold the gun with the left hand several inches forward of the trigger-guard, the length of stock would have to be altered accordingly; and, therefore, just as a man holds his gun far forward of the breech or closer up to it, so does the length of the stock from the trigger to the three points named require modification.

The consideration of this subject is of cardinal importance, and from all points of view it is one that essentially concerns the sportsman.

The misconception which is abroad respecting the measurement of stock length arises from the fact that the right hand and arm have been regarded erroneously as the governing factor in determining the length of the stock, and little or no attention has been given to the part played by the left hand which grasps the fore-part of the gun. Having the latter consideration in mind, then to fix the length measurement of stock from the trigger alone is erroneous.

When shooting, the left arm is more or less extended, while the right arm is not. Supposing we lengthen a stock already a fit as regards its length measurement, and so readily enabling the shooter's right hand to manipulate the triggers, it will be seen that it would be imperative on the shooter's part to hold his lengthened gun with the left hand nearer to the trigger-guard, in order to use it at all, this drawing in of the left hand being equivalent to shortening the stock. The left hand, which grips the fore-end and holds the gun to the shoulder—while the right hand is used

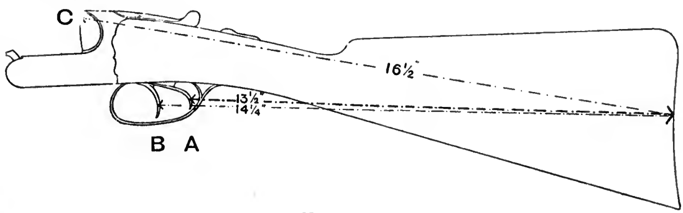


FIG. 190.

A is length from fore-trigger to centre of butt, $14\frac{1}{4}$ inches.
B ,, ,, left ,, ,, ,, ,, ,, $13\frac{1}{2}$,,
C ,, ,, standing breech ,, ,, ,, $16\frac{1}{2}$,,

to pull the trigger—in the majority of cases governs the length of the stock, and not the right hand.

In a two-trigger gun, the right hand moves easily from one trigger to the other ; but, on changing the finger from the right trigger to the left, the length of stock is not altered, it remains precisely the same. The advantage of a one-trigger gun does not lie in the fact that there is the same length of stock for both barrels, as some claim, but because not having to relax your grip of the stock you do not disturb the position of the gun at the shoulder.

From this it is obvious that the real points of measurement, for the length of the stock, are from the standing breech to the end of the butt, and that the position which the triggers may occupy is of only relative importance. In comparing a one-trigger gun with a two-trigger gun, this point is illustrated. If both guns are to match in length they must measure the same from the standing breech to the end of the stock, and providing the trigger of the one-trigger gun is at, or between, the position occupied by either the right or left trigger of a two-trigger gun, both weapons will handle alike.

From the illustration, Fig. 190, of a typical stock length of $14\frac{1}{4}$ inches from the fore-trigger, it will be gathered that the length of the stock remains the same whatever may be the position of the triggers. Therefore, to place one trigger anywhere within the limits of the respective positions occupied by these triggers, *i. e.* between the points A and B, cannot alter the length of the stock.

I should not have mentioned this self-evident fact, but for the reason that some sportsmen, aye, and gunmakers too, maintain that if one trigger is substituted for two triggers, and made to occupy the position of the left trigger, the gunstock is thereby shortened, and therefore, they have argued with confusion, that supposing there is an inch between a right and left trigger, by adopting the left trigger form on your one-trigger gun you must, therefore, lengthen the wood of the stock an inch. Such a contention is, of course, erroneous.

Westley Richards inform me that this point frequently arises, but the sportsman invariably has to admit the view taken here; they have converted some hundreds of two-trigger guns to their one-trigger system, giving the sportsman a left trigger occupying practically the same position as the rear trigger did before the gun was converted. Guns so altered have invariably given satisfaction, and many sportsmen have found their shooting improved thereby.

That is natural, in firing with one trigger instead of two, the gun is not disturbed from the shoulder when letting off the second barrel, as is the case with a two-trigger gun.

The effects of a stock made too long are—

1. Shooting too high and behind.
2. Kicking.
3. Slow shooting.
4. Frequently bruised fingers.

With a stock made too short you may have—

1. Tendency to shoot under or in front.
2. Kick.
3. Injury to the cheek.

It is, perhaps, difficult to say whether discomfort arising from recoil is greater from a short or from a long stock. The longer stock makes the muscles sore, but it is certain that the too-short stock punishes the shoulder and gives more shock to the shooter, thereby inducing gun-headache. The recoil of a shot-gun will sometimes be felt severely on a prominent cheekbone, and the forefinger may become bruised against the first trigger on pulling the second, or the second finger may receive an injury by jarring against the trigger-guard. The latter of these very unpleasant experiences, however, may be due to an abruptly curved guard or insufficient depth of checker to give the hand a firm hold, and the former from lack of distance between the two triggers.

In order to keep a gun steady when in firing position, the end or heel-plate of the butt should be checkered and made to fit the shoulder; thus a man with a rounded and well-developed breast would require the bump and toe of his gun to exceed the centre in length to a greater degree than would a flat-chested man.

The Bend of the Stock.

The chief factor controlling the elevation of a gun is the bend of the stock, and the amount necessary is determined by the physical development of the shooter and his mode of shooting. A man with a short, stiff neck generally requires more bend than one whose neck is long and pliant, owing to the difficulty the former finds in bringing down his head to the stock. However, some sportsmen, Americans especially, prefer to shoot with their heads erect, and by an increased bend make the gun do the work of coming to the eye, instead of lowering the face to the gun.

The bend requires very careful adjustment. Even the correct length of stock that enables the shooter to align straight would be neutralized by an incorrect bend, which may either make a man shoot too high or too low. The expert gunfitter knows that for many reasons the tendency is to shoot low, and he counteracts it by careful study of individual idiosyncrasies. The bend is a simpler matter to arrive at, and I think it may safely be said that the differences in a man's build, that is in the length of neck, are not so wide as is the case with regard to his length or reach of arm, and, therefore, the range or limit of measurements which constitute the bend of a gun-stock is narrower.

Shooting beneath the object often results from the use of a weapon with too much bend, and, of course, the opposite effect follows if the gun-stock is too straight. A weapon sighted to shoot a little high is an undoubted advantage, for flying game nearly always rises ; a going-away hare or rabbit must be shot *over*, not *at*, if the distance be considerable, whilst for on-coming driven birds the aim must also be high. Moreover, during a heavy day's shooting the tendency is for the left arm to become a little weak and tired and so allow the barrels to drop, for on this arm falls most of the strain of aligning and keeping the barrels at a true level.

Cast-off.

"Cast-off" is the deviation of the stock to the right or left of the centre of the barrels. Nearly all old-fashioned weapons were made perfectly straight, but now the consideration of this important point in the measurement of a gun receives the deserved and careful attention of every gunmaker worthy of the name.

It is one of the most difficult of measurements, perhaps the most difficult, and at all events the one requiring the greatest nicety of adjustment.

When shooting, say with the right eye, the necessity of bending the stock to bring the centre of the barrels in its direct vision is evident, for supposing there is no casting off of the stock, the barrels would be pointing to the left of the object, and the eye looking at an angle across the barrels instead of down the centre of the rib. Thus it will be seen that a gun which shoots to the left of the object can be made to shoot straight by casting the stock to the right ; and if it shoots to the right, by bending the stock to the left. Instead of casting off the stock to the right the comb is sometimes hollowed out where the cheek touches it, but this practice greatly disfigures the gun, and should, where possible, be avoided.

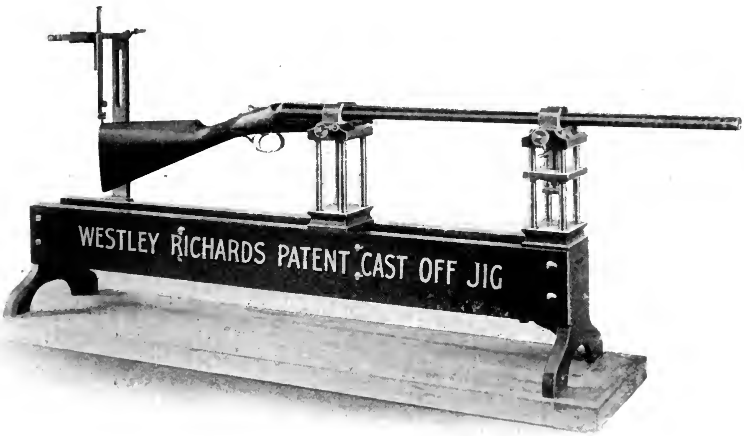


FIG. 191.

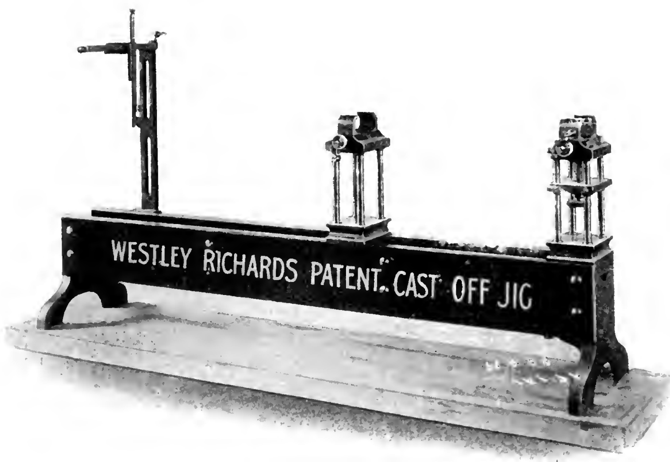


FIG. 192.

Correct length and bend enable a sportsman to shoot straight at on-coming or going-away birds, or ground game. It is only by aid of the cast-off that the sportsman is able to obtain complete mastery of the movements of the gun either to the left or to the right. Whether it be more difficult to take a bird crossing to the right or one crossing to the left is not my present purpose to discuss; authorities differ. I think that generally speaking a sportsman moves his gun easier from left to right, but this is largely a personal question, and I speak only from my own experience. This question of cast-off it will be seen affects the fit of a gun to a degree no other measurement can be admitted to do, because it makes all the difference between success and failure when a sportsman has to deal with the most difficult shots. This measurement requires a considerable amount of thought and care, which I believe the true expert is prepared to give it; and, at all events, I recommend sportsmen when being fitted to be especially careful in getting an assurance that their cast-off is correct. Difficult swinging shots will, nevertheless, at times continue to baffle the best sportsman, and will need much patience and practice in order to take them with a sense of ease and mastery. The sportsman who is fortunate enough to have gained this excellent degree of marksmanship will, to the unpractised sportsman, be apparently bringing them down from the right or from the left with unstudied ease; and he will, furthermore, be unable to explain to his less fortunate companion how he does it. One sportsman said to another, "I'll hang if I can get these crossing shots; how do you do it?" And his friend replied, "Well, I swing." And that is all that is necessary to do, and keep on doing it.

The necessary cast-off can be ascertained only by actual trials at moving and stationary targets, for it is practice alone that will determine the part played by the eyes.

In individual cases special requirements are sure to arise from time to time, but these questions can be generally solved by the use of a little thought and common-sense. Above all things, grotesque absurdity in design, which sometimes passes as gun-fitting, should be avoided. I remember a man who was a fairly good shot with a gun of average and respectable dimensions. But once he appeared with a stock of fearful and wonderful shape. I think he called it "middle-eyed," "central-visioned," or something of the sort. Evidently seized with the "gun-fitting craze," then just commenced, he decided to have the fit of his gun tested. "How did it happen?" said I. "Oh!" he replied, "I fired down a tube, the man said 'One guinea,' and they sent it back like this!" When re-altered to a rational shape he again shot well enough, and thereafter resolutely abjured the allurements of the freak-fitter.

In short, I do not agree with "rational stocks," "central-visioned" or "oblique-eyed" stocks, or similar freaks of the adventurous gunfitter; and in this I am supported by Westley Richards, who inform me they frequently have had guns of this type to alter on lines of reasonable and practical dimensions and form. Moral: Sportsmen should avoid the freak-fitter and his abortions.

Having satisfied himself that he has been fitted with intelligence and care, the sportsman when in the field will do well to forget all about length, all about bend, and cast-off, and think only of killing the game in front of him. In fact, to quote the words of a sporting poet of a hundred and fifty years ago—

> "There's nothing more requir'd but steady care
> T' attend the motion of the bird, and gain
> The best and farthest lineal point you can;
> Carrying your piece around, have patience till
> The mark's at best extent, then fire and kill."
>
> PTERYPHLEGIA.

I am of opinion that, given a gun of proper fit and other details answering to the sportsman's personal taste, one selected from stock is preferable to one newly built to order, on the grounds that it is well-seasoned and that time has been allowed for the wood to settle down to the iron work; in fact, the gun has matured, and with such a gun the sportsman starts with a better guarantee.

TRY-GUNS.

The first firing gun with a stock capable of adjustment or movement for altering the length, bend, and cast-off was, I believe, an American production. Years before, the *Field* described a "measurement" gun with the stock capable of being adjusted to any required dimension within reason, manufactured by Westley Richards. But this and other similar types no doubt gave the cue to the firing gun with adjustable stock introduced to us from America, and was the means of the production of the firing "try-gun" introduced by Mr. Jones, of Birmingham. The system especially known as the "Jones Try-gun" was adopted by Messrs. Holland and Holland with no little success. But now all who pretend to the calling of gunmaker boast of their gun-fitting "try-gun." At first, no doubt, there was more in the claims advanced for the try-gun than in its performance. The gunmaker hitherto had applied his trained experience to a sportsman's individual needs concerning "fit." But the try-gun, at the outset, was supposed to dispense with this. The veriest tyro, "the man in the street," could now not err, it was claimed, with this magic instrument. The mechanical device would do it all, and no brains on the part of the fitter were required. Even though years have passed there is much of this spirit abroad, and frequently, because the try-gun operator is a person of superficial knowledge as regards the actual requirements of sport, misfits occur. It is questionable whether, taking the gun trade as a whole and the body of shooters who buy and use guns, the number of victims of ill-fitting guns has in any way decreased.

The try-gun, like any other workman's tool, can only become efficient in the hands of a skilled operator.

A skilled operator of the try-gun is not to be picked up at any street corner. He is a product, and not a spontaneous growth. He must have undergone a training of at least a lustrum—and two would be better—before earning his diploma as a reliable gunfitter. Few, however, amongst those who daily engage in this delicate and important task of gun-fitting can claim to have undergone the necessary apprenticeship.

Besides this misconception as to the capacity of the try-gun, there is a similar error made in respect to the work of gun-fitting. To an outsider it would appear that gun-fitting forms a separate calling, independent of gun construction and of the expert knowledge from which it springs.

This view is natural, and doubtless proceeds from the establishment of certain shooting schools, some of which exist principally by gun-fitting, and are conducted by men who are not gunmakers, nor have they been trained to any branch of gun-building.

It is from such unsatisfactory conditions that we get practices concerning "stock measurement" altogether at variance with what gunmakers know to be correct and necessary. A gunfitter who is not a gunmaker sometimes holds "views" concerning length, bend or cast-off; and either in one measurement or another he will advocate for all shooters who come his way his own particular and pet idea, turning out in this respect all "fits" of one pattern.

Then an opposing school, for some reason apparently valid, is found to be advocating measurements the reverse of the first man, and the result is perplexity to the sportsman, and a badly-fitting gun to boot. This would be avoided if the gun-fitter were a gunmaker. I have no sort of doubt that the most perfect fitting guns are produced by those gunmakers who have their own grounds and personally have the gun-fitting branch under their own supervision. I do not say that a sportsman will, even under these circumstances, be able to ensure a correct fit, for this depends upon the gunmaker. With this reservation I would, nevertheless, lay it down as a rule that it is better to go to a gunmaker to be fitted than to any person independent of the gunmaker's calling.

Shooting schools fulfil a useful purpose in affording opportunity for practice to those having no other facilities. Personally, I consider that the best practice can only be obtained in the field, but others there are who do not altogether share my view. When, however, these useful schools or practice-grounds trench upon the gunmaker's calling without fitness or warrant, it is only right to point the sportsman's attention to the actual facts.

The movements of the measurement gun referred to were obtained by screw joints worked by keys. There are several systems in use, not all of equal merit. The length of the stock shows a detached portion of the butt fixed to a plate having screws, which receive into the other portion and shorten or lengthen the stock as they are turned out or in. This method is slow to adjust, and is difficult to keep rigid, a most vital consideration in a test gun. The simplest method of adjusting stock length I have seen consists of separate butt pieces, which slide over and lock into studs projecting from the opposite portion of the stock. They can be attached and detached in a few seconds, and are perfectly rigid when fixed. Any number of separate butt-ends, varying only $\frac{1}{32}$ inch and of all shapes, may be used, giving the sportsman a more varied degree of butt-length at all points than any other system.

The most up-to-date firing try-gun I have seen is the Westley Richards, which I will describe and illustrate.

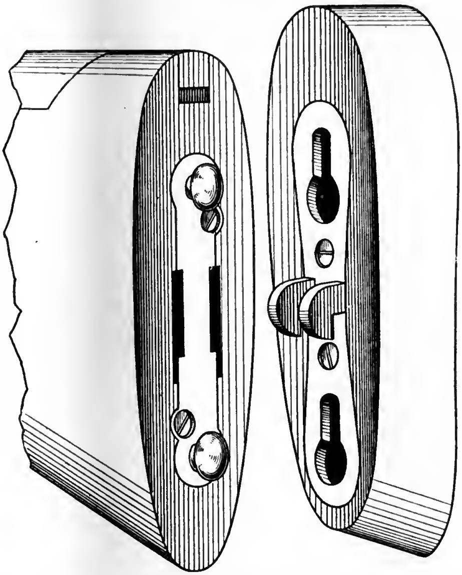


Fig. 193.—Westley Richards Try-gun Stock, showing one of a Series of Detachable Butts of varying thickness.

Double-barrel hammerless 12-gauge.
Top lever.
Ejector.
Detachable locks.
One-trigger, two pulls only.
Length of barrels, 30 inches.

The accompanying illustrations show one of the detached pieces of stock and method of adjustment (see Fig. 193).

There are no fewer than 15 different detachable pieces for determining the correct length and shape of stock.

Rifle : Stock Measurements.

It is customary with sportsmen to send their shot-gun as a model for the stock measurements of any rifle they may have in the course of construction. But in view of the fact that the rifle may be often used in the prone position, as on occasion when deer-stalking, it is advisable to have the stock a little shorter, and for such use an increased bend is an advantage. Of course it will not be advisable to go too far in the direction either of increasing the bend or of reducing the length of the stock on a sporting rifle, for the simple reason that neither the deer-stalker nor the hunter of big game constantly fires from the recumbent position, and besides, the elevation of the sights above the rib of the barrels tends to lessen the objection. Still, the fact remains that most sportsmen will secure the best all-round results if their rifles have stocks somewhat shorter and more bent than are the stocks of their shot-guns.

Second-hand Guns.

There are many sportsmen who, for some reason or another not necessary to ascertain, use guns purchased in a haphazard sort of way, second-hand from a gun-jobber, or from a friend, without troubling about fit, or general suitability. Medium-grade guns are only too often obtained from small dealers, local gunsmiths, ironmongers, and what not, in fact from people not sufficiently expert to know and to advise upon the general outlines of a gun or of dimensions even approximate to the purchaser's requirements.

I have asserted, and it cannot be gainsaid, that not all gunmakers are gunfitters; and no gunfitter can, on the whole, be reliable unless he is also a gunmaker.

But there is a whole army of shooters to-day "blaming their luck" and suffering unnecessary disappointment from using guns which are both ill-constructed and ill-fitting. Perhaps one reason is that certain people imagine that makers of the very highest grade guns are either incapable of catering for the medium-grade guns, say at £20, or do not desire to do so. This is an error. Some of the makers of the finest guns, to my knowledge, turn out the most reliable medium-grade guns, and guns for keepers down to £10 or less, and it may be asked who is most likely to be a good judge of a gun and be capable of producing it—the man whose efforts are specially devoted to the production of the highest grade of gun, perfect in mechanism, finish, and shooting; or the manufacturer whose wares limit him to a lower standard in all essentials such as mechanism and durability, as well as non-essentials, such as finish and external embellishment?

A gunmaker of acknowledged skill and repute in designing best guns and rifles, if entrusted with orders for medium-grade colonial and keepers' guns, may be relied upon to give better value for money than the small maker, dealer, and jobber can afford to give. He is in a larger way of business, and purchasing the materials of construction in a wholesale way can thus buy to better advantage.

If you want a best gun go to a best maker. If you need a medium or low-grade gun, go also to a best maker (you are always sure of getting a gun from a best-class manufacturer). You can get a low-priced weapon elsewhere, but often, and decidedly, it is not a gun. When buying a second-hand gun go to a bona-fide gun manufacturer of repute, you will get better served than by going to a mere dealer.

No respectable dealer, however, would refuse permission, if requested, for the purchaser to submit the gun to the original maker or make direct inquiry concerning it.

The guarantee of a second-hand gun, given by a high-class manufacturer, although the gun is not of his own make, may be safely taken, in all the essentials of soundness and efficiency. He does not know, perhaps, the history of the gun, and in those cases where fuller information is needed consult the original maker. This is a purchaser's question, and not one incumbent upon the seller.

Possibly the seller may not be in a position to know that a gun made by A has been converted to single-trigger by B, or has been re-bored or re-stocked by C. He may apparently be in the position of misleading the purchaser when, of course, nothing of the kind may be intended.

Recently a gun-dealer advertised a second-hand single-trigger gun by A for sale. The gun, certainly, was of A's make, but the single trigger was by Z, and defective as to conception and working. This was, of course, distinctly unfair both to the maker A, who had a really good and reliable system of single-trigger, and yet was made responsible for Z's defective system, and to the purchaser, who believed he was getting A's single-trigger, not Z's.

The would-be purchaser should, therefore, make strict inquiry of all that appertains to a second-hand gun, not of the seller's own make, and be satisfied with a reasonable guarantee. When, however, in doubt, consult the original maker, who, as a rule, can reproduce from his records all particulars of any weapon he has manufactured.

I think it possible that to those sportsmen whose instincts run into second-hand transactions, and who prefer doing business with dealers, jobbers, etc., the following advisory rules may be helpful—

1. See that the gun shoots standard patterns. If a 12-bore, with normal charge and $1\frac{1}{8}$ oz. No. 6 shot, at a distance of 40 yards on a 30-inch circle, a cylinder barrel should average not less than 130, a modified choke 180, a full choke 210 to 216. If a 16-bore, with normal charge and 1 oz. No. 6 shot, under same conditions, cylinder barrels should average about 110, modified choke 130 to 160, and full choke 180.

2. A gun should balance properly in the hand. A gun muzzle-heavy should be rigidly avoided. If slightly butt-heavy this is generally an advantage to counteract tendency to shoot under and behind.

3. If not fitted for your gun ascertain the dimensions of the stock. If a man of average build and figure, a stock should measure $14\frac{1}{8}$ or $14\frac{1}{4}$ inches from fore-trigger to edge of the butt midway between toe and heel. For a man of short stature and arm-reach, a 14-inch stock would be necessary. If a tall man, or a man with long reach of arm, the stock should measure from the fore-trigger $14\frac{1}{2}$ or $14\frac{5}{8}$ inches. A very tall man needs, as a rule, a stock $14\frac{3}{4}$ inches long and sometimes $14\frac{7}{8}$ inches.

Bend.—An average man requires a stock, say, $1\frac{3}{8}$ or $1\frac{1}{2}$ inches at comb and $1\frac{7}{8}$ and 2 inches at butt. If the man has a long neck, the stock should measure $1\frac{5}{8}$ inches, bare, at comb, and $2\frac{1}{8}$ and $2\frac{1}{4}$ inches at butt.

Cast-off.—Average man $\frac{1}{8}$ to $\frac{3}{16}$ inch from centre line. If the man is broad-chested, more as a rule is needed.

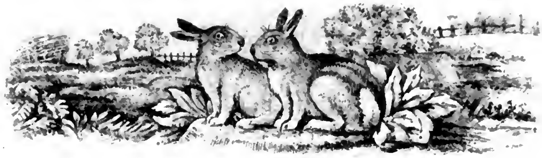
Safety.—Above all obtain a guarantee of safety. A gun long in use will, doubtless, have deteriorated from its original strength. If in doubt upon this point the prospective purchaser should submit the arm to its maker, who no doubt would willingly examine and report thereon for a small fee.

If these rules are observed, a more or less reliable gun with effective fit may be assured.

By neglecting them the haphazard purchaser is entirely at the mercy of chance. In order to secure, as he is persuaded, "a bargain," which may be so, or not, in point of intrinsic value, he may be saddled with a gun which, even if safe, is in all essential dimensions an absolute misfit. He may, for instance, be a tall man, requiring a stock $14\frac{3}{4}$ inches long, and yet "the bargain" is only 14 inches, or *vice versâ.*

There are, doubtless, in pawnbrokers' shops throughout the country guns of tempting appearance and still more tempting price which no sane sportsman would dare to shoot. I have been informed that just as there is a traffic in spurious *objets d'art*, so are second-hand guns deliberately made up to order for re-sale, and the little garret-maker continues to dump new guns on to any "convenient pawnbroker," to meet the second-hand demand.

While, therefore, by observing these rules the second-hand gun buyer may get a safe gun of dimensions which will enable him to perform with considerable satisfaction, by haphazard selection he may get hold of a gun that he cannot possibly, or ought not to attempt to, shoot with. But of course a perfect fit can only be ascertained by an expert gunfitter.



CHAPTER XV

GAME SHOOTING IN GREAT BRITAIN

MUCH has been written in the past relative to the habits, the rearing, and the preservation of game. I think, therefore, it will be well not to encumber the pages of this work—whose primary object is to treat of guns—with matter of that nature. This being so, I will give such brief particulars respecting the game and wildfowl of this country, as well also the guns, sizes of shot, and shot patterns, which I think may best assist the modern sporting gunner to bring to bag his game with greatest certainty and despatch.

In the course of a lengthy experience I have ever secured the most instantly fatal results from fairly close-shooting guns and shot of good size. For example, I generally shoot partridges, driven or walked up, with No. 5 shot. Some of my friends and acquaintances use No. 6 or No. 7; whilst for driven birds I have found them using even No. 8 shot.

Certain advocates of small shot use plain cylinder guns and No. 7 shot for partridges in the thought that this combination the better enables them to hit; this, doubtless, on the principle that the more the pellets the greater the chance of striking the object.

But hitting is not everything. The true sportsman goes out to kill as cleanly and as quickly as possible at all fair sporting chances presenting themselves; he hates to see game go away badly pricked, to be recovered only after a lengthy search, or possibly not at all. Some men have told me that they use No. 7 shot for driven game because the shots are fired at short range. This argument is weak, for, assuredly, No. 5 shot will do everything that No. 7 will accomplish in the way of killing at twenty yards, and put far fewer pellets into the bird; whilst at twice the distance, or more, No. 5 will kill when No. 7 merely wounds.

I fail to perceive that it is more advantageous to place half-a-score pellets of No. 7 or No. 8 shot in a partridge's body when some three or four pellets of No. 5 amply suffice. If the user of small shot regards his handiwork in this direction with satisfaction, it is certain the gamekeeper will not do so on picking up his badly-mauled bird. But should neither shooter nor keeper regret such occurrence, those dining upon these birds will be thoroughly justified in anathematizing the superabundant lead stuffing that, perforce, is served up with them.

Some of the best game shots of our time are in favour of No. 5 shot for general purposes. Earl de Grey, I am told, uses $1\frac{1}{16}$ oz. of No. 5 shot in guns giving with this charge patterns of 175. This, of course, is very close shooting, these patterns comprising 74 per cent. of the shot charge. They afford an excellent object-lesson of what may be accomplished with full-choke guns and No. 5 shot in the way of game shooting. Earl de Grey's skill is too well known to need additional comment here.

Another first-rate shot—the only sportsman who can speak of having killed upwards of one thousand grouse in one day—Lord Walsingham, tells me that he prefers No. 5 shot for all purposes, even for snipe on a wild day, and that he has very seldom used any other size, and never to any advantage.

Another drawback attached to the use of small sizes of shot, No. 7 and No. 8, is that they are much more easily deflected from a true course by the wind than are the weightier pellets comprised in a charge of No. 5. On windy days a considerable percentage of misses may be traceable to this deflection when a too light shot is used for killing high pheasants, or, indeed, any game at maximum sporting ranges.

Through the courtesy of Kynoch, Ltd., I have been able to ascertain some facts with regard to the British sportsman's estimate of the relative values of the various sizes of shot for his purpose. These figures go to prove that the majority prefers No. 5 and rejects the smaller sizes. The actual percentages are as follow—

No. 5 shot.	45 per cent.
" 6 "	21 " "
" 4 "	16 " "
" 8 "	4 " "
" 3 "	3·7 " "
" 7 "	2·4 " "
" 2 "	1·7 " "
" 5½ "	1·5 " "
" 1 "	1 " "
Sundry other sizes	3·7 " "

The above percentages are compiled from the sales of Kynoch, Ltd., during the shooting season of 1905–6, comprising in the aggregate very many millions of shot-gun cartridges.

My gunmakers, Messrs. Westley Richards, are about to load up cartridges with a new size of shot. Some of these were sent me to try, and after giving them a thorough testing upon black game, grouse, pheasants, hares, partridges, wild ducks, and rabbits, I am inclined to think that for 12-bore guns having some choke, these cartridges will prove highly advantageous for most forms of shooting once October sets in.

The Great Bustard (*Otis tarda*), the largest indigenous land bird of Europe, once occupied a prominent position on the British game list. Now it is totally extinct as a resident, and visitors from Spain or elsewhere appear only at rarest intervals. Although the extermination of these noble game fowl was doubtless assisted in some measure by a systematic gathering of their eggs or young, and the killing of adult birds, it is probably the fact that the great body of aboriginal bustards was driven from this country by plough and harrow in the great wheat-producing era of a century or so ago. At that time all Europe was in arms, and the population of this country being infinitely more dependent upon internal resources than is now the case, a vast acreage of primeval pasture-land, long the home of the bustard, was broken up in order to grow wheat, a cereal then three times more costly than it is at the present day.

Were bustards now to be found in hundreds upon southern downs, East Anglian wastes, Yorkshire wolds, or Scottish hills, as they once were, it is questionable whether their presence would largely affect the policy of British gunners, as, in order to preserve a sufficient breeding stock, the pursuit of these birds would probably present the chief characteristic of a solitary deer-stalk rather than an organized hunt comprising many sportsmen. So distinctly novel a form of sport as the shooting of the great bustard would, doubtless, be reserved to a favoured few. Thus the presence of these birds would have the effect of enhancing the letting value of some large tracts of wild land—of wold and down—at present regarded as of little worth as a sporting asset.

FIG. 194.—BUSTARD.

In those countries where bustard are still met with, there are at least two distinct methods to be followed by the sportsman in their pursuit. One is to have them driven over, when they may be killed with an ordinary shot-gun. The other plan is that of stalking them with a small-bore rifle which will give accurate shooting up to 300 yards. The Westley Richards ·300-bore "Sherwood," and the W. W. Greener ·310-bore "Sharpshooter" are rifles admirably suited for this purpose, as also the Fauneta ball- and shot-gun.

The Capercailzie, or Capercaillie (*Tetrao urogallus*).—In respect of size this bird is at the head of the grouse family in Great Britain. As a sporting bird, however, it must be relegated to a secondary position when compared with its relative, the red grouse. Our autochthonic race of capercaillies was said to be extinct seventy or more years ago. At that time some birds were procured from the pine forests of Sweden, and turned down upon the Taymouth Castle estates of the Marquis of Breadalbane, where they have thriven well and multiplied exceedingly. As the result of this individual endeavour, many of our northern woods have been restocked with capercaillie, and these fine grouse are now to be found on several estates in central and northern Scotland.

It may surprise some sportsmen and naturalists to learn that even in England, and so far south as Bedfordshire, capercaillie have been successfully acclimatized. Nevertheless, this is the fact, for the Duchess of Bedford informs me that capercaillie—as also black game—procured from Austria, and turned down in the pine woods in the vast park at Woburn Abbey, are doing well.

I gather from the *American Field* that consignments of game birds, comprising several scores of capercaillie, willow grouse or ripa, and hazel grouse, have, during the autumn of 1905, been imported into the United States from Sweden. In the event of the birds doing well, these are but the precursors of further and larger importations.

The fir woods of the Scottish Highlands are the natural habitat of the capercaillie in this country. There these birds subsist upon the young buds and shoots of the larch and spruce firs. According to season, this diet is varied with fruits, berries, and cereals. In search of the latter the capercaillie will often wander far afield, and thus frequently may be found by the sportsman at some considerable distance from its roosting-ground.

The fully-grown male capercaillie measures 35 inches, in extreme cases 36 inches, in total length, and weighs from 10 lb. even up to 14 lb. The female measures some 10 inches shorter, and weighs little more than half as much as the male. Birds so thickly furnished with flesh and feathers, so strong on the wing, so large and heavy as are cock capercaillie, certainly require a hard-hitting gun and weighty shot pellets. The greatest success in their pursuit is likely to be obtained from the use of a fully-choked 12-bore gun and No. 3 or No. 2 shot.

A full-choke gun is decidedly to be recommended for throwing these large shot to best advantage, and especially when engaged in the pursuit of capercaillie.

In $1\frac{1}{8}$ oz. of chilled No. 2 there are 135 pellets, and as a good choke gun should place about 100 of these within a 30-inch circle at 40 yards, the sportsman who manages to fairly centre his bird with such pattern will be practically certain to kill.

In $1\frac{1}{8}$ oz. of No. 3 shot there are 157 pellets; with this shot-charge the full-choke 12-bore should make a pattern of about 120. With such gun and charge capercaillie may be surely killed at distances up to 40 yards or possibly a bit over.

Small-shot votaries may demur at my selection of sizes of shot, which, doubtless, they consider to be unduly large. To this objection I may remark that it will be better to err in this direction, for if this large shot hits it will be more likely to kill than shot which is too light. It is preferable to miss outright with large shot than to commit the folly of merely wounding game with small shot. Three pellets of No. 2 shot will cause the instant collapse of any old cock caper at 40 yards, whereas a dozen pellets of No. 6 at the same distance will in all probability result only in sending away a badly-pricked bird to die a slow and painful death.

The Black Grouse; female, Greyhen (*Tetrao tetrix*).—So far as England is concerned, the sport of "heath-poult" shooting has long been a decadent quantity. One hot August day eighty years ago, Colonel Hawker, with a friend, shot eight brace over ground where probably not a single black grouse has been seen for many years past. This well-known writer mentioned with pride the fact of securing his bag "without missing a shot;" but to his successors this and like pages of history cannot be read without regret, for these, we are told, were all young birds, affording the easiest possible shooting, and had but the Colonel and his contemporaries displayed more discretion and less zeal, restraining their hands until later in the season when the young black game were better able to take care of themselves, it is possible we might not now be regretting the disappearance of this interesting game bird from our southern counties.

Black game still manage to maintain a more or less precarious foothold on some of the elevated districts in south-west, west, and mid England. In Cumberland, Westmoreland, and Northumberland, they are probably to be seen at their best in so far as this country is concerned.

Several attempts have been made to introduce black game into Ireland. So far these efforts have not been attended with the success they merit.

Fig. 195.—Blackcock.

In Scotland, Roxburgh, Dumfries, Perth, Inverness, and Aberdeen are the counties most prolific of black game. But here also sportsmen for years have been recording a gradual diminution in the numbers of the black grouse. This decadence of the species has been variously assigned to unfavourable breeding seasons, to the shooting of greyhens and immature birds, as also by some to the introduction of the pheasant.

I would suggest that possibly the Departmental Commission recently appointed to investigate the question of the cause and the prevention of grouse disease, during its session might find opportunity to look into this matter. To find the true cause or causes leading to the extinction of our black grouse, would be the surest step towards remedying the evil ; and, surely, with a body of men so well acquainted with the circumstances, and having every facility for acquiring special knowledge, the task should not be an impossible one.

Personally, I am of the opinion that it would be well if black game were not shot before the first of September. This, both in the interests of sport and the proper preservation of the indigenous avifauna of Great Britain. In August the young birds have not properly matured; they are deficient as regards size, muscle, and feather. Consequently they then present an easy mark which only the veriest tyro or arrant duffer should miss.

But it is not alone the young and undeveloped black grouse that should be spared in August. At that season the old birds have not recovered from moulting, and by reason of their skulking habits and poor flight, they, too, become an easy prey, even to the inferior shot.

Blackcock in August and blackcock in October are totally different creatures. In the former month they cannot be accorded high rank as a sporting bird; in the latter month, the powerful swinging flight of the driven blackcock will certainly offer full scope for the display of the sportsman's ability to correctly judge pace and distance.

I well remember the first occasion on which I essayed to stop driven blackcock, and the chagrin with which I regarded their undeviating flight as they sailed serenely onward after my poor efforts to arrest their course. It was a stormy day, and I am convinced that those birds, flying down wind, were travelling at something like the rate of a mile per minute. Blackcock, however, do not need much assistance from the wind to quicken their rate of progression; although rising from the ground somewhat heavily, they soon get up speed, and ordinarily move at a famous pace. Young sportsmen should remember this, and swing the gun well forward when taking crossing shots both at black game and capercaillie.

To the inexperienced, great bulk and a high rate of speed scarce seem to be compatible; nevertheless, practice will quickly teach the observant that the various members of the grouse family, although of bulky proportions, are far from being slow and deliberate of movement. Once this knowledge is gained the young shooter will do well to shape his own movements accordingly.

It will be well to convey a further hint that may prove of considerable value to the sportsman when first attempting to shoot black game. In shooting at game birds—or wildfowl of large size, such as wild geese—there is a general tendency to under-estimate distance. Misled by the great size of his bird, the gunner is prone to regard it as being nearer than it actually is; thus a blackcock at 45 yards may quite easily be considered to be no farther away than 35 yards. Such miscalculation will have the effect of minimizing any allowance made in the forward holding of the gun, and in this way it comes quite within the range of probability that a forward allowance of 3 feet at a swiftly-crossing bird may, owing to the 10 yards' under-estimation of distance, result in the sending of the shot a full yard to the rear of the passing bird.

All things considered, the most satisfactory size of shot to use for the killing of blackcock is, I think, No. 4. I am now speaking of strong full-feathered October birds. In August, those who care for that form of shooting may double up young birds with No. 6 shot, riddling them with these small lead pellets at 20 or 25 yards ranges. Emphatically, however, this is not sport. Later in the season, having then their full protective covering of strong feathers, black game require a heavy blow to bring them down in decisive manner. A good choked 12-bore will place more pellets of No. 4 shot within a 30-inch circle at 40 yards than the best cylinder 12-gauge ever bored can of No. 6 shot at the same range. Few sportsmen of experience will deny that the weighty No. 4 pellets are more certain to bring to bag an old blackcock at that range than are the much lighter pellets of No. 6 shot.

If, on the other hand, it is argued that No. 6 shot is better than No. 4 for shooting blackcock at shorter ranges, then I must say that I disagree with this proposition also. Any one firing a good choke and a good cylinder 12-bore with standard loads, the former with No. 4 shot and the latter with No. 6 shot, at 25 yards, will perceive that the cylinder puts many more pellets on the 30-inch circle than does the choke. The striking value of the No. 6 pellet being considerably less than that of the No. 4.

The RED GROUSE (*Lagopus scoticus*).—The "discovery" of the red grouse was of highest economic importance to this country. It is solely on account of this fine game bird that hundreds of thousands of acres of the poorest, most infertile land in these islands have been turned into rich revenue-yielding properties.

Rather more than one hundred years ago Colonel Thornton made his famous tour through the Scottish Highlands, and the published account of that pleasing pilgrimage caused consider-

FIG. 196.—RED GROUSE.

able attention to be directed to the remarkable sport-affording capabilities of that rugged country. This, notwithstanding, it is well within the recollection of the more elderly among living sportsmen that the full sporting significance of the red grouse came to be realized. For many years past hundreds of thousands of pounds have been expended upon this bird in this country. In fact, it is doubtless not unreasonable to assume that the pursuit of the red grouse causes considerably more than one million sterling to change hands each successive season in these islands. The rent-roll of Scottish shootings alone has been estimated to reach

£400,000, and if to this be placed the amount paid for vast moors in England and Wales, and to some small extent in Ireland, there can exist no reasonable doubt that the annual grouse shooting bill, inclusive of rent and expenses of the British sportsman, reaches a sum whose minimum computation well exceeds seven figures placed abreast. Truly, therefore, the red grouse may be regarded as a rich national asset, in addition to being a prime factor in British sport.

Viewed in this light, we cannot but approve the wisdom of the appointment, by Mr. Balfour's Government in 1905, of a Commission for the purpose of inquiring into the causes, and for suggesting remedies for that dread enteric scourge known as "grouse disease." This Commission, under the chairmanship of Lord Lovat, is now engaged upon its task, and, inasmuch as the survival of the red grouse is a matter of national importance, it is the wish of all who desire their country's welfare, that permanent benefit may accrue from the inquiry.

Three different methods of procedure are followed by sportsmen in their pursuit of grouse. These tactics are much the same as those adopted in the shooting of the ever-popular partridge, and they are as follow—

1. Shooting over setters or pointers.
2. Shooting by guns walking in extended line abreast—generally termed "walking-up."
3. Shooting the birds driven by an extended line of drivers over a similarly extended line of gunners concealed in butts.

These methods are ranged in order of seniority. As remarked, much the same tactics are employed in the shooting of partridges, and in so far as this is the case, my remarks under these headings, with some few modifications, as to environment and sizes of shot to be used, apply, also, to partridge shooting.

Great similarity exists between the two first named, inasmuch as in both these forms of sport the shooter approaches the hidden game, which on rising flies away from him. In the system known as driving, there is a total reversal, as here the birds are made to approach the concealed gunner. Given birds at which to shoot at fair ranges, in all cases it will, I think, be generally conceded that one's skill is not taxed so severely in either dogging or walking up game as it is when that game is driven. The primary reason for this is that on rising, birds start off at their slowest rate of speed ; whereas, on reaching the guns, driven birds usually have attained their maximum speed, and so have acquired their greatest power to swerve and alter their course. Partly on this account, the shooting of walked-up grouse—or for that matter partridges also—rising near at hand in the early days of the shooting season, is quite an easy matter compared with the shooting of driven birds. Thus when walking up his game in August, the practical sportsman should not take undue credit to himself on scoring his right and left at grouse.

Some few weeks later, however, the shooting becomes infinitely more difficult. Grouse will then rise 35, 40, or more yards away, and the shooter perforce has to be very prompt in getting on to his bird to score a kill in good style. To take long-range shots at grouse with shot so small as No. 6 can, I think, be characterized as little short of cruelty. Nothing less than No. 5 should be used, as so much of the body of a going-away bird has to be penetrated by the shot before any vital spot may be reached.

For wild-rising strong grouse, I would recommend the use of a full-choke 12-bore with $1\frac{1}{8}$-oz. loads of No. 4 shot. With this combination, the gunner secures a killing distribution of the shot at 40 yards or more, and few grouse that are fairly hit go away wounded. The deadly nature of these weighty shot pellets so used should convince the most ardent believer in small shot as to the comparative inutility of his charges.

I may here convey a hint which experience tells me may assist the tyro when essaying to kill these wild-rising birds. It is that he should aim high. This for two good reasons: (1) that such birds are invariably rising when shot at, and (2) in order to counteract the natural dropping tendency of the shot at lengthy ranges. If when taking aim the bird is clearly seen above the rib of the gun the shot will fly beneath it. Whereas if aim be taken from 1 to 3 feet above the bird, according to its mode of flight and distance, nine times out of ten that bird will fly into the shot. By shooting in this way, with suitable guns and cartridges, grouse and partridges may be killed with certainty at lengthy ranges.

For the shooting of driven grouse, No. 5 shot is one of the most effective sizes that may be used. The pellets are fairly weighty, and the pattern sufficiently close to decisively arrest the flight of strong driven grouse at all ordinary distances. It is conceivable that under certain conditions of grouse driving, shot somewhat larger than No. 5 might be used with some advantage. The new size of shot I have mentioned earlier in this chapter, as having been recently introduced to my notice by Messrs. Westley Richards, is intermediate in size betwixt Nos. 5 and 4. The full charge for a 12-bore of this new size contains 225 pellets, as against the 245 pellets of No. 5.

As already remarked, I find after a somewhat exhaustive trial that this new shot, which I believe has been termed "Celerita," is a most useful size. Those who consider the change from No. 5 to No. 4 somewhat too wide, inasmuch as they regret the loss of pattern the change entails, will doubtless welcome the new-comer. I think that for grouse shooters generally, this will prove a most useful size, as for wide-rising birds they will maintain a fair pattern with excellent penetration. Whilst for shooting strong driven grouse on windy days, this enlarged edition of No. 5 will carry truer than lighter sizes. Another advantage I can foresee, also, is that this shot will enable the shooter to open fire upon oncoming grouse a little sooner, and so the better enable him to work in his second barrel—a decided advantage this, one that possibly is not quite sufficiently appreciated, for one constantly observes men taking a driven bird when practically atop of them, firing a hasty first barrel thus, and then, on spinning round, a far hastier second barrel at a fast-vanishing form.

This latter observation reminds me that some men I have seen practically ignore oncomers, and make it a more or less constant practice to fire after birds that have passed their stand. Unless the sportsman is pretty nimble in getting round, he may often find that driven grouse, or partridges either for that matter, especially with the assistance of a favouring breeze, will have receded 35 or 40 yards before he can get on to his bird. In such event the probability is great that the small shot man will send more wounded birds away than he using No. 5 shot, or, possibly, that new size previously mentioned.

I would far sooner see a man shoot at oncoming than at going-away birds at distances greater than they may with certainty be killed. In the former event he will at least have the opportunity for finishing off with his second barrel any bird wounded by the first barrel, whereas in the latter case a pricked bird will carry on and so, frequently, be unrecovered. Thus, the one amounts to a mistake which may be rectified, the other remains altogether an evil without remedy and without excuse.

With birds coming over thick and fast, the shooting of driven game is most exciting and enjoyable sport. Then a man has need of all the nerve and skill he can summon to his aid. It matters not how he may excel as a shot when walking up his game or whilst shooting over dogs, on commencing to shoot driven birds he will assuredly have much to learn. The degree of skill in handling the gun necessary to constitute good shooting when dogging or walking up game, will avail but little in driving, as in the latter phase of sport the speed of manipulation will at times have to be twice as great. But that is not everything. To thoroughly excel, the driven-game shot must be—

1. Prompt in selecting the object at which to aim ;
2. An accurate judge of distance ; and
3. Of the speed of flight of his quarry ; and, what is more,
4. He must be able to thoroughly control himself, and so remain unnerved during periods of intense excitement.

No one can hope to become the possessor of these necessary qualifications in the course of a lesson or two. Practice at driven game, and plenty of it, will alone insure success in driven-game shooting.

I have purposely emphasized the foregoing for the reason that under ordinary conditions skill in the shooting of grouse or partridges coming and passing at railroad speed, may be considered as being twofold more difficult to acquire and maintain than is skill in the shooting of those birds as they rise in front of the gunner.

In a general way, walked-up game is difficult to kill only when rising wildly. Strong birds getting up 35 or more yards away certainly call for the display of speed in handling the gun, as of quick perceptive power in singling out an object at which to aim. What is more, they need a gun with more or less choke, and nothing smaller than No. 5 shot to insure killing at these ranges.

The male red grouse measures $15\frac{1}{2}$ to 16 inches in total length; the female is usually about half-an-inch shorter. Grouse are very variable as to weight. A good average weight appears to be from 20 to 24 oz.; the highest recorded weight is, I believe, 2 lb. Quite recently I shot an old cock red grouse which all but drew down the scale at 2 lb.

The PTARMIGAN (*Lagopus mutus*).—In these islands ptarmigan

FIG. 197.—PTARMIGAN.

are now found only in Scotland. There they manage to subsist on the bleak hill-tops at a considerable altitude above sea-level. The coloration of the summer plumage of the ptarmigan is an admixture of chestnut and buff, black and white. In winter this is changed for a coat of pure white, save for the outer tail feathers, which remain black. This seasonal change of plumage affords the bird considerable protection against its enemies. In summer it is scarcely discernible against the greys and browns of its environment, whilst amidst the snows of winter the ptarmigan is equally difficult to distinguish. But for this protective covering, the bird could seldom escape the keen eye of eagle, of peregrine falcon, or of that industrious egg-hunting rascal, the hooded crow.

Ptarmigan are not sufficiently numerous to call for the exercise of any special measures in their pursuit. In the opening weeks of the shooting season, an excursion to the hill-tops in search of these birds may prove a pleasurable proceeding, as probably there will then be nothing worse than rain to encounter—and it can rain too on those wind-swept heights. Later in the season a considerable amount of discomfort or even of risk may attend these excursions for on those hills thick fogs drift up quickly, and, unless a proper amount of care be exercised, the sportsman may have an extremely unpleasant experience, not unattended by danger. Sportsmen bent

FIG. 198.—PHEASANT.

on ptarmigan shooting will, therefore, do well to take with them a thoroughly competent guide, one having a sound practical knowledge of the topography of the district, and a thorough acquaintance with local weather conditions.

For the shooting of ptarmigan No. 5 shot will be found to be the most generally useful size. Ptarmigan are smaller than red grouse, the length of the male of this species being 15 inches.

The PHEASANT.—Of the genus *Phasianus*, several species have been acclimatized in Great Britain. The dark-plumaged ringless *P. colchicus* ranks first in point of seniority. Whether this bird was indigenous, or was introduced by the Romans, as some historians inform us it was, has not been clearly established.

In any case, pure-bred birds of the original stock are seldom found now, interbreeding to a considerable extent having taken place with the more recently-introduced ring-necked pheasant from China, *P. torquatus*, and possibly one or two other species, hence a hybrid race of pheasants exists in most game-coverts in this country. This interbreeding has been further accentuated by the introduction of several other species of the genus. As, however, the resultant offspring does not appear to have deteriorated in so far as the all-important qualifications of fertility, hardiness, sport-giving properties, and excellence as table-birds are concerned, the propagation of these hybrid pheasants is not so regrettable a matter as otherwise it might have been.

Several other species have been introduced here from time to time. Among these may be mentioned the green-bellied Japanese pheasant, *P. versicolor*, the Prince of Wales' pheasant, *P. principalis*, the Chinese ringless pheasant, *P. decollatus*, the handsome Mongolian ring-necked bird, *P. mongolicus*, and others.

The bar-tailed or Reeves' pheasant, *P. reevesii*, the male of which species measures over 6 feet in total length owing to its remarkably long tail, has also been introduced into Scotland and elsewhere in these islands. It is a strong flyer, and is said to thrive well.

The modern system of hand-rearing is responsible for a vast increase of pheasants throughout the country. It is doubtless not too much to say that pheasants have been increased a hundredfold by this expensive method. It is an increase that is attended by many benefits to the community at large, to those engaged in the production of guns, ammunition, and the other requisites of the sportsman, as well as to a large section of the rural population —gamekeepers, farm labourers engaged as beaters, and others. In fact, the whole question of game preservation and of the shooting of game is an economic consideration of high national importance. Some unenlightened bigots would try to make believe that it is the selfish pastime of the favoured few, and with such view in mind, these warped visionaries even go as far as to glorify the poacher—who is in reality a thief—and decry the legitimate pursuit of game. They ignore the fact—if, indeed, they were ever fully cognizant of it—that hundreds of thousands of good coin of the realm are annually spent by the shooters of this country. The latter, moreover, are directly responsible for an increased revenue of many thousands of pounds, the amount paid annually for game licences.

In order to be precise on this point I have made inquiry, and I am indebted to the Accountant and Comptroller-General, Somerset House, London, for the following interesting statistics of the game and gun licences issued in the United Kingdom during the year 1904–5—

Game Licences.		Gun Licences.	
Number.	Net Receipt of Duty.	Number.	Net Receipt of Duty.
	£		£
72,996	189,600	238,026	117,910

The numbers of game licence holders at £3, £2, and £1 respectively were as follows—

Number at £3	. . . .	52,605
„ £2	. . . .	6,011
„ £1	. . . .	8,113
„ £3 (Gamekeeper's)	. . . .	40[1]
„ £2 „	. . . .	6,227
Total	. .	72,996

It would be interesting to be able to gather reliable statistics as to the numbers of the different species of game, birds, and animals killed annually in Great Britain.

During the shooting season, both general and sporting press provide a constant succession of totals having reference to the quantity of game killed on moor, manor, or forest. But so far as I am aware, there has not as yet been an attempt made to render any satisfactory account of the totals comprised in the yearly game-bag of Great Britain.

At this juncture it may not be altogether irrelevant to remark that from some Continental states official statistics relative to the quantity of game killed are forthcoming. The Minister for Agriculture and Forestry in Austria gives the following information respecting the Austrian game-bag for 1905—

[1] Ireland only.

Game.		Vermin.	
Stags	24,366	Lynx	36
Roe deer	117,830	Fox	40,125
Fallow deer	2,743	Martin	18,376
Chamois	10,484	Weasel and stoat	64,255
Wild boar	3,963	Polecat	32,667
Hares	1,656,811	Otter	1,135
Rabbits	143,394	Wild cat	115
Black game	6,671	Badger	5,708
Francolins	12,008	Squirrel	229,212
Partridges	1,483,907	Eagle	751
Pheasants	218,696	Falcon	11,113
Quails	51,863	Crows and pies	481,514
Woodcock	33,014		
Snipe	12,515		
Wild geese	1,632		

The following is the average annual game-bag for Prussia, compiled from statistics of the last ten years—

Stags	14,000	Quails	100,000
Fallow deer	8,500	Pheasants	150,000
Roe deer	120,000	Bustards	800
Wild boar	9,000	Woodcock	40,000
Hares	2,500,000	Wild duck	275,000
Rabbits	300,000	Snipe	52,000
Black game	9,000	Grives	1,200,000
Grey partridges	2,500,000		

This is stated to represent an annual weight of 15,000,000 kilogrammes for an area of 350,000 square kilometres—a quantity something less than one-hundredth of the annual total of meat consumed in Prussia.

Pheasant shooting as now carried out in this country may be classed under two distinct headings—

1. Hunting the birds out of hedgerow, spinny, gorse, and bracken-clad hillside, or other covert, with spaniels and beaters.

2. Driving the pheasants by means of a strong posse of beaters out of the thick undergrowth of the larger woods over a line, or lines, of guns posted either within the covert, along the bridle-paths or roadways, or on the open ground outside.

Fifty years or more ago, the opening day of the pheasant shooting was regarded as of well-nigh supreme importance by the game shooter. Then our forefathers would go out in good time on a bright October morning, and after a hard day's walking, come home thoroughly well satisfied with a few brace of pheasants. A good deal of this patient questing for game goes on at the present day. It is excellent fun, and often enough fairly hard work, for an old cock pheasant is endowed with sturdy legs, and he well knows how to use them in manner most advantageous to his bodily well-being. If, however, I were to hazard a conjecture, it would be that the pheasants so shot do not form 20 per cent. of the total killed annually in Great Britain.

A great change has been effected in pheasant-shooting methods in recent years. Sportsmen have decided that, wherever possible, it is better to shoot at the head rather than the tail of their quarry. All are not satisfied with the killing of game rising and going away at ranges under 25 yards. The spirit of the skilled shot rebels against too much of that sort of thing; he desires a form of shooting that will place a greater tax upon his skill, and at the same time gives his game a chance to escape. Luckily those situations are now more abundant where the prowess of the gunner and the ability of the pheasant to keep out of the way of the shot may be fairly tested.

The modern tendency in the shooting of pheasants is to present as difficult sport as possible. The game preserver, aided by his keepers, constantly strives to offer to his guests the most sporting shots and difficult form of shooting. Pheasants are made to rise well, and guns are placed in such position relatively to the flight of the birds as may exercise the skill of the shooter to the fullest extent. Dales, valleys, and depressions are taken advantage of so that pheasants—and for that matter grouse and partridges also—may be sent over the guns at increased altitudes from adjacent higher lands. Naturally, under these conditions, birds move at a far higher rate of speed than when springing from the ground, and where high birds can be secured, shots at 40 yards or over frequently must be taken.

Some game shots of the day characterize as absurd the use of a choked gun for game shooting. However, to lay down an absolute rule of this nature would be far from advisable, so much depends upon the situation and the nature of the sport. For walking up young, tender, and imperfectly-feathered game in the opening weeks, or for driven grouse or partridge, with birds closely incoming and low flying, patterns of only 100, with No. 6 shot, at 40 yards might suit some people, for the reason that a range of 25 yards or so will represent the outside limit of the shooting.

Pheasants, however, are somewhat different, inasmuch, as by reason of their nature and environment, they can be made to fly over the guns at altitudes greater than those usually reached by grouse or partridge. This fact, coupled with the shot-resisting qualities of the strong, full-plumaged cock pheasant, causes this game bird to be held in the very highest esteem by all shooters who try their skill in the handling of the shot-gun against the remarkable powers of flight displayed by one of the finest and most sporting of our game birds.

Indeed, it is not too much to say that present methods of bringing pheasants over the guns have effected a revolution in the shooting of these birds. It is quite true there are many pheasants now killed in the old-time way—that is, by pursuing them with spaniels in the thick hedgerows and undergrowth; and this, it cannot be denied, is a fascinating and withal exciting pursuit; for, if the actual shooting of the birds does not amount to much, there is still the added zest and excitement of the chase and the pleasure of seeing good dogs at work. Many small and straggling coverts and outlying patches of shelter still have to be shot out in this way, but it is not in this direction that the cream of the sport with the pheasants is now to be obtained.

Many shooters, on being questioned as to the boring of their guns, will tell you they use cylinders for game shooting. As a matter of fact, however, a pure cylinder gun has never existed. There has always been a narrowing of the bore towards the muzzle, at all events in the best-bored guns. For fifty years prior to the introduction of the sudden constriction at the muzzle termed "choke," Westley Richards's 12-bore cylinder guns were invariably of the nominal measure of 13-bore at the muzzle. This may have been the case with other makers' guns for aught I know. But whilst under old black-powder conditions this boring gave patterns of about 120 with No. 6 shot, the same boring under modern conditions gives average patterns of 140. An increase in the difference of the bore at the muzzle as compared with the breech of only five-thousandths of an inch might give a pattern of 150 or 160 pellets on the 30-inch circle at 40 yards.

I think the system known as "choking" pure and simple represents an entirely different method of boring from the old cylinder gun, although the latter was usually narrower at the muzzle than at the breech. The sudden constriction of the choke, which may be anything between twenty- and forty-thousandths of an inch, necessitates a special formation of cone or lead into the parallel portion of the bore at the muzzle forming the choke. Cylinder-bored guns made on the old lines are not chokes in disguise, as is frequently alleged, but as I think I have shown are distinct from the choke bore proper.

On looking at the table in Chapter V, giving particulars of the shooting of this class of gun, it will be ascertained that on a change being made from No. 6 shot to No. 5 shot, the patterns then produced averaged 122 pellets on the 30-inch circle, whilst with Westley Richards's new size of No. $4\frac{1}{2}$ shot, the patterns are 120, which seems to point to the fact that this size suits that style of boring remarkably well. This being so, I should say that this fairly weighty shot is to be recommended for the shooting of strong high pheasants from modern cylinder-bored guns.

For exceptionally tall pheasants even weightier pellets than the above may be found necessary. For these birds the 12-bore choke, also mentioned in the tables given in Chapter V, with its regular patterns of 141 with No. 4 shot, will be found to confer a decided advantage. Wherever really high pheasants are to be killed, the good shot who uses this latter form of boring will assuredly kill his game in better style than will those gunners of equal ability who use cylinder guns and small shot.

Now and again one hears of No. 3 being used on exceptionally high pheasants. In some quarters this practice has been decried as unsportsmanlike. But, surely this argument is unreasonable, for it will be found that in shooting at very high pheasants with fairly close shooting guns and No. 4 shot, fewer birds will go away wounded than will be the case whilst shooting such game with cylinder guns and shot so small as No. 6. With the first-named guns and charges and their narrowed and more deadly circle of shot, it is more certainly a case of clean killing or clean missing. This, I take it, is a more sportsmanlike method than the shooting at high pheasants with guns and charges more or less ineffective,

Fig. 199.—Partridge.

which all too frequently send away a considerable percentage of wounded birds that are only recoverable at some distance from the firing point, or, may be, are left to be picked up by the keepers on the following day—if gathered at all.

As is generally known, the Grey Partridge (*Perdix cinerea*) is indigenous, and our most widely-distributed species. The French, or Red-legged Partridge (*Caccabis rufa*), introduced from the Continent, is now plentiful in certain parts of England, especially along the eastern side of the country south of the Humber. Prior to the institution of the driving tactics now so commonly practised on many large sporting estates, the red-legged partridge was not held in high esteem, especially by sportsmen who shot over dogs. The fact is, this bird is far too prone to trust rather to his legs as a means of escape than to his wings, and this exasperated the dog man, as thereby his pointers and setters were rendered unsteady. This hatred of the bird was carried to such an extent on some estates that I have known gamekeepers make it a practice to destroy the nests of the French partridge. Now, however, where driving is practised, this feeling has been overcome, for it is found that these birds drive fairly well, as they usually come on steadily and at good pace straight ahead over the guns. They, moreover, form a pleasing and picturesque addition to the partridge bag, which otherwise would be comprised solely of the grey birds, and so apt to become a trifle monotonous.

In recent years great efforts have been made to increase the stock of the deservedly popular grey partridge on many large sporting estates throughout the country. Mr. Herbert Page, of Hertford, who knows as much as most people about the importation of foreign partridges—he being one of the foremost of our importers—states that although the first supply came from Hungary, he doubts if that country alone could now supply all the requirements of the British game-preserver without running a serious risk of denuding itself of birds. Consequently, these supplies are now drawn from a more widely-extended area of mid-Europe, comprising many other states included in both the Austrian and German empires. The partridges introduced therefrom are specifically the same as our own grey birds, and are eminently suitable for crossing with the latter by reason of their hardy and prolific nature.

To introduce birds from a warmer climate than our own would be bad policy. The imported "Hungarian" comes, however, from a country where snow covers the ground to a good depth for some months every winter. Therefore, birds that are able to exist under climatic conditions so adverse, are practically certain to thrive well in our country under seasonable conditions far less severe. Mr. Page advises me that the best time for procuring these foreigners is November and December, as then they are strong and healthy, having encountered no privations through shortage of food or bad weather. A month or two later these birds have become more or less attenuated, and are then less able to endure the hardships of the journey here.

Another great advantage of securing early supplies is that these partridges are fresh from the fields, and there is thus less likelihood of getting birds that have been kept in captivity for many days or even weeks.

Many of my previous remarks relative to the shooting of red grouse apply also to partridges, and as these tactics are so well known it will but be traversing a well-worn theme were I further to enlarge upon them.

In recent years, shooters of driven partridges have evinced a tendency in the direction of both lighter guns and reduced shot loads. The old $1\frac{1}{8}$-oz. charge has been found to be more than sufficient for the work in hand, whilst its heavier recoil distresses the gunner more than does a lighter weight of shot. Thus $1\frac{1}{16}$ oz. of shot is a charge now in frequent use; some men go further than this, and reduce their loads to 1 oz., whilst in extreme cases we hear of $\frac{7}{8}$ oz. of shot being used in 12-bore guns. Light loads such as these certainly conduce to the comfort of the shooter where the firing is rapid and long sustained, and for killing driven partridges at 20 or 25 yards, they doubtless prove all sufficient. All the same, we are rapidly reverting to the use of 20-bore charges in the 12-bore, and it is not improbable that the next question exercising the minds of the modern partridge driver will be the advisability of taking to 20-bores of good weight for the shooting of these loads; as, with 12-bore cartridges so loaded, there may be, even with the most careful and intelligent loading, some sacrifice in the matter of velocity when firing these light loads from cartridges and guns of wide bore—and the maintenance of velocity is a matter of grave import to the shooter of the dodgy driven partridge.

Wherever the expenditure of cartridges is great, and it is found expedient to use $1\frac{1}{8}$-oz. or $1\frac{1}{16}$-oz. loads, shooters will be well advised to have their 12-bores built to weigh not less than $6\frac{1}{2}$ lb. Sportsmen who tramp for long days through turnips or other thick game shelter, or over rough hilly ground, might well be excused a desire to keep down the weight of their guns to the smallest possible limit. As in sport of this nature many shots will be obtained at full sporting ranges, the desire to employ cartridges of full power is equally excusable. In such case, full loads may possibly be fired from light guns without experiencing any great degree of discomfort, and more especially for the reason that in such situation the firing will not be heavy.

In the shooting of driven game the firing is usually far more rapid and sustained, and for this form of sport guns of full weight are desirable. The shooter standing behind a butt or fence, whilst shooting driven grouse or partridges, is not likely to experience the feeling of gun-tiredness which comes over the gunner undertaking a twenty-mile tramp over rough heather or knee-deep root crops. Here, therefore, the gun, if a 12-bore, should weigh not less than $6\frac{1}{2}$ lb., if comfort in quick firing be desired, even with $1\frac{1}{16}$-oz. shot loads.

Taking the season through, one day with another, I find I secure the best all-round results with No. 5 shot, when shooting partridges; and this, whether driving, shooting over dogs, or walking up the birds.

Fourteen or fifteen ounces is the average weight of a grey partridge; birds weighing 1 lb. are occasionally met with, but the heaviest recorded is one from Norfolk, reported by Mr. J. E. Harting, the shooting editor of the *Field*, which weighed 20 oz. The red-legged partridge is usually a few ounces heavier, and exceeds the grey partridge in length by about 1 inch. The heaviest Frenchman recorded was also killed in that great game county, Norfolk, and weighed 25 oz.

The QUAIL (*Coturnix communis*) may best be described as a miniature partridge in appearance. In habits also, the two birds, when side by side on British corn-lands, have much in common. There, however, the resemblance ceases, for, unlike the partridge, the quail is a migratory species, visiting these islands in the spring, and, after nesting, returning south again towards the end of September or beginning of October. The number of our visiting quail varies greatly, and it is seldom now that British sportsmen are able to report a "good quail year." When numerous, quail are widely distributed over this country during the summer months. The slightly milder climate of Ireland suits these birds well. A generation or two ago they were to be found there all the year round, being then, in fact, more numerous than the partridge in some districts.

Quail are not sufficiently numerous in this country to call for any special remarks relative to their pursuit. As a rule, they are easy marks for the gunner ; on being flushed, they spring to a fair height and fly off at an even pace straight away. Were they plentiful enough to warrant my recommending special loads, I should say by all means take No. 7 shot. In a quail country, a good combination will be a 20-bore gun with $\frac{7}{8}$ oz. of No. 7, but if big game is there met with, one of Westley Richards's new "Fauneta" shot and ball guns would be far preferable. As

FIG. 200.—WOODCOCK.

explained elsewhere, this deadly little tool fires a 290-grain bullet with the accuracy and force of an Express rifle at 300 yards, whilst from the same barrel a charge of $\frac{3}{4}$ oz. of loose shot may be used. With this gun-rifle I have shot grouse, partridges, hares, rabbits, wild duck, etc., with practically the same certainty up to 30 yards as I could have done with a 12-bore and $1\frac{1}{8}$ oz. of shot.

The WOODCOCK (*Scolopax rusticola*).—Amongst migratory game birds, the woodcock stands highest in the estimation of British sportsmen. It is, perhaps, just doubtful whether all our woodcock may be referred to as migrants, seeing that some few nest in our woods. These, however, in their turn are also, I believe, more or less of migratory habit. Partial migrants they are, perhaps, inasmuch as they move from one part of these islands to another; or, possibly, wholly migratory in the sense that they cross the seas to still more temperate climes.

The number of woodcock nesting here has shown some slight increase in recent years; still, these summer birds are as nothing to the thousands of over-sea woodcock which arrive on our coasts in October and November for the winter, spreading themselves over the country from north to south, east to west.

It is, doubtless, correct to say that more cartridges are expended upon woodcock, in proportion to the numbers killed, than upon any other game bird, except the snipe. When meeting with this bird in the open, a fairly decent shot should be able to score a kill without much difficulty. Amidst bushes and timber the case is different, as here the dodgy alert woodcock will occasionally prove a source of much discomfort to the best of shots.

In thick covert the great point for the shooter to observe is to come to terms with his quarry as quickly as possible, for the longer firing is deferred the greater the chance given to the woodcock for slipping out of sight, and thus for intervening branches or tree trunks to intercept the shot. No. 7 shot is a favourite size with some people for this kind of shooting. I much prefer No. 5, as these weightier pellets are better able to maintain a killing velocity after cutting through twigs, foliage, or other light obstructions; and, for this reason, if I did discard No. 5 when shooting woodcock or pheasants in thick covert, or killing rabbits in thick undergrowth, the change would be in the direction of a larger—not a smaller size. For shooting woodcock outside the coverts, or in an open country, No. 5 shot with a gun more or less choked is to be recommended. With this combination woodcock may be killed up to 50 yards with tolerable certainty, provided that necessary concomitant to all success in shooting, "straight powder," be used.

There are three species of snipe met with in this country. The first in point of size is the Great Snipe (*Scolopax major*), which is also known as solitary snipe, and double snipe, by reason of the fact that it is just about double the weight of the common snipe.

The great snipe is not of much account here as a sporting bird, it being merely a casual visitor in late summer. It is usually found on the eastern side of the country, which thus appears to be the westernmost limit of its migratory track, north and south. This snipe weighs from 8 to 10 oz., according to condition.

The COMMON SNIPE (*Scolopax media*) also has various aliases, it being known amongst gunners as the "single" snipe, as distinct from the "great" or "double" snipe just mentioned. It is also termed "full" snipe to distinguish it from the "jack" snipe,

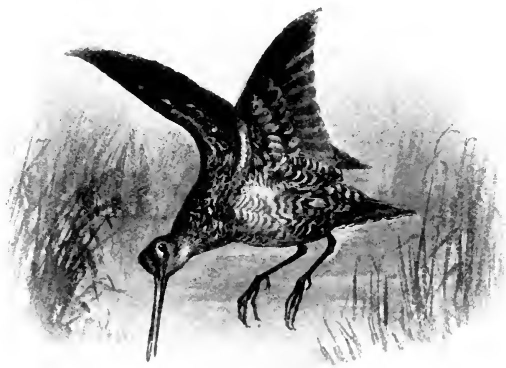


FIG. 201.—SNIPE.

which, in turn, is known as "half" snipe. Some snipe nest in these islands, but their numbers are few in comparison with the thousands which annually reach our shores in autumn.

Snipe are held in high estimation by the sportsmen of this country, and deservedly so, for many a wet bleak marsh would prove a veritable slough of despond but for the presence of these birds. There is great fascination in the sport of snipe shooting; first, by reason of the fact that the movements of these birds are veiled with so much uncertainty—one might almost say mystery—that one never quite knows when a visit to their haunts is likely to be productive of sport. One day they may be present in quantity, on the next they may have entirely vanished from the district. The second reason is the difficulty of hitting; snipe dart and twist with such rapidity on rising that most people find them difficult to bring down, and it is generally a human characteristic that, in sport especially, one strives hardest after that which is most difficult of attainment.

There is a general consensus of opinion in favour of No. 8 shot for the shooting of snipe. I have but one objection to urge against this size, *i.e.* it is practically useless for wild duck, if, as is often the case, they should be present upon the snipe marsh. In such event, a compromise might well be effected by the use of No. 6 shot; or, if preferred, the snipe shooter might have No. 8

FIG. 202.—RED DEER.

in his first barrel and No. 5 in his second barrel. It would be found that, in addition to an occasional duck, this reserve would account most handsomely for many a good snipe in the course of the day—particularly in windy weather.

Of furred game, there are in Great Britain some half-dozen different species which provide sport for rifle or shot-gun. These are: (1) Red deer; (2) fallow deer; (3) roe deer; (4) brown hare; (5) Scotch hare; (6) rabbit.

The RED DEER is met with in truly feral condition in Scotland, and there deer-stalking is carried to a fine art. In that country there are some one hundred and fifty deer forests, comprising a total area not far short of three million acres. In the letting of deer forests, the value is usually expressed at so much for each warrantable stag, the price ranging from £30 to £50, according to the bodily condition of the animals, the quality of their heads, and the nature of the ground. A rough general estimate as to the acreage needed for the production of a good stag places this at five hundred. Still, so much depends upon the quality of the herbage on a forest, as also the amount of artificial food, hay, corn, or roots supplied during winter, that this estimate can only be accepted as approximately accurate.

For the shooting of red deer, many types and forms of rifle are employed, from the noisy magazine arm with its far-sounding rattle to the most approved modern single or double deer-stalking rifle.

The high bullet velocity exhibited by the Mannlicher ·256, the Mauser ·275, as also the ·303, impelled many deer-stalkers to the use of these weapons. In respect of range and trajectory, there is little to choose between these and the ·350, ·360, and ·375 Express rifles, as now made by Rigby, Holland, Purdey, Lancaster, Westley Richards, and other good makers. The ·375/·303 Accelerated Express, described elsewhere, possesses the highest velocity of all, and so, doubtless, more will soon be heard about the rifle.

There has recently been witnessed the introduction of an entirely new arm, the "Fauneta," of ·558-inch bore, a ball- and shot-gun having a bullet velocity of 1660 feet per second. This handy little gun is described on page 250, and it, too, is a thoroughly practical weapon for the deer-stalker's purpose.

For the shooting of Fallow Deer, which, as is well known, is a much smaller animal than its red congener, the aforementioned rifles are certainly powerful enough. If anything, they may be said to err in the direction of an excess of power, and in this respect it may not be out of place to convey the warning that in shooting fallow or any deer in English deer parks, or in other more or less circumscribed areas and wooded country, the greatest care should be exercised to insure the safety of one's neighbours. Those rifles above named, it should not be forgotten, are of high power and great ranging capacity of bullet. It might be thought that the shooter's ability to hit his stag would determine this question of safety, but this is not altogether correct. In a great measure the form of the bullet will dominate this position ; a solid, or even a hollow, bullet fired from, say, a Mannlicher rifle may, after passing through a deer, still have sufficient velocity remaining to kill a man half-a-mile beyond. It appears, therefore, to be almost imperative that a bullet of the most expansive character should be employed in this particular class of sport, one that will instantly mushroom upon impact, and, if possible, expend the whole of its energy upon the object of aim.

With the use of solid or imperfectly expanding bullets, more deer, or other game for that matter, will be sent off wounded than

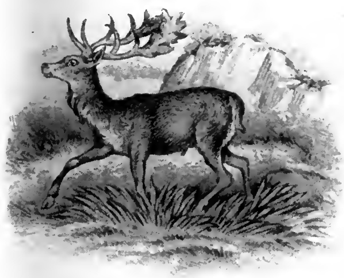


FIG. 203.—FALLOW DEER.

will be the case when fully expansive bullets are used. Therefore, on humanitarian grounds alone the latter are to be recommended.

I once raked a buck from end to end with a non-expanding bullet of large calibre at a less range than 100 yards ; the carcass of this animal was eventually discovered a long distance away from where the shot was fired, several days elapsing, however, before it was found.

The ROE DEER, like the red deer, is truly indigenous to these islands ; this is more than can be said of the fallow deer, for, so our naturalists tell us, the latter is an introduced species. By way of paradox, they also assure us that the long extinct Irish "elk," an animal of colossal proportions, with horns stretching upwards of 11 feet from tip to tip, was a fallow deer.

Two distinct methods of shooting the roebuck are practised in this country: (1) stalking, and (2) driving. Another method of shooting roe is followed by some continental shooters. This consists in calling up the bucks by imitating the call of the female. The true sportsman of this country will have none of these tactics, which he looks upon as poaching.

Taken all in all, stalking must be considered a more sportsman-like procedure than driving, although it is least often undertaken. Owing to their extremely acute hearing, keen eyesight, and remarkable olfactory powers, roe are not easy to secure by either method. One might say that driving is the easiest and most certain plan for killing these animals, but possibly this even may be open to question if the two are compared on the strict basis of kills to shots fired. In stalking, all is dependent upon individual effort, and when a shot is obtained, which may not be often, the experienced shot will not fire unless tolerably assured of killing. In driving, on the contrary, quite an army of drivers, either bipedal or quadrupedal, may be engaged, as also a number of guns, and many random shots are fired, with the result that the number of head of game bagged per gun may be no greater with all this assistance from the drivers, than is secured by the single-handed "still hunter."

Of all the rifles that I have shot with, the ideal weapon for roe-stalking is the double ·300-bore Sherwood, of Westley Richards. As already mentioned, this handy little arm combines bullet accuracy with deadliness, to a range greater than has hitherto been attained in small-bore rifles with charges so light.

The copper-capped bullet is a serviceable projectile for stopping not alone roe deer, but even fallow deer up to 250 yards, and as the noise of the report from this small-bore rifle is very slight, a comparatively small area of one's ground is thus disturbed by the shot.

The effectiveness of the little Sherwood can best be judged by the following carefully-kept records of its work on deer and wild geese, which I have gathered from my own notes and from reports given by Mr. W. A. Nicholson, shooting expert to the *Midlothian Advertiser* and other journals.

As reported in the Scottish papers, the expansion on impact of the copper-capped bullet is so great that this small rifle has been used even on red deer with good results. However, on account of its limitations in regard to power, it is of necessity that on smaller game its best work will be accomplished; for instance, a Haddingtonshire paper records the killing of fallow deer weighing about 130 lb. with this Sherwood rifle at various distances. The following reports briefly summarize some of the excellent shooting accomplished with this small-bore rifle—

Inverness-shire: Three stags, one a 10-pointer at 355 yards; 15 fallow deer—weight up to 139½ lb., longest range, 300 yards; seals and porpoises, 147; wild geese, 16.

Argyllshire: Fallow deer, 4; roe deer, 6; stag, 1.

East Coast of Scotland: Seals, 12; porpoises, 3; wild geese (pink-footed), 7.

Ireland: Seals, 17; wild geese and large fowl, 49.

In British Columbia the Sherwood has accounted for black bear, caribou deer, and mountain sheep. A truly marvellous performance for so light a weapon and bullet. Still, if we consider that the Mannlicher rifle, with its 162-gr. bullet and a velocity of 2000 or more feet per second, kills a mile away, why should not the Sherwood with its 140-gr. bullet and 1450-feet velocity kill at 300 yards?

In this country roe deer are usually driven to the guns by beaters. In such case, rifles should only be placed in the hands of the most steady and experienced shots; in fact, I believe that in many thickly-wooded districts where roe are driven, the use of the rifle should be altogether vetoed. The killing of these graceful little deer with the shot-gun may not be looked upon as the most sportsmanlike proceeding, still, this is preferable to standing by the hour together expecting every moment to hear your neighbour's bullet come whistling past.

Some people go out roe driving with No. 5 shot cartridges, but this size is certainly too small, for in the excitement of the moment many ridiculously long shots are taken. With No. 5 shot roe should not be fired at any further away than about 25 yards if broadside on, and at much less distance when going away from the shooter. A good close-shooting 12-bore with $1\frac{1}{8}$ oz. of "B. B." shot will certainly prove far more effectual in roe driving.

Two species of hare are indigenous to Great Britain, the Brown Hare (*Lepus timidus*) and the Scotch or Mountain Hare (*Lepus variabilis*). The latter is also known as white or blue hare from seasonal changes of coloration, its coat changing to white in winter. As is generally known, the brown hare is met with in England and the Scottish Lowlands. The blue hare is found in the higher lands of Scotland and in Ireland; it is

Fig. 204.—Hare.

rather smaller than the brown hare, and has a more rabbit-like appearance owing to its shorter ears.

Since the Ground Game Act of 1880 conferred upon the occupier of land the right to kill hares concurrently with his landlord, hares have seriously diminished in many sections of the country. It is to be regretted that in England the hare is not wholly protected during the breeding season. The Hares Preservation Act of 1892, it is true, enacts that in Great Britain hares shall not be sold or exposed for sale during March, April, May, June, or July, but this half measure does not prevent the killing of these animals. In Ireland it is different, for the Hares Preservation (Ireland) Act of 1879 forbids the killing or taking of any hare or leveret between the 20th day of April and the 12th day of August in any year, under a penalty of twenty shillings, with costs of conviction. This is as it should be, save for the fact that the commencement of the close season might, with advantage, have been made to take effect from the beginning of March.

For the shooting of hares, whether this game be walked up or driven, nothing smaller than No. 5 shot should be used in a general way. So soon as December arrives and hares have acquired their thick winter coats, then No. 4 certainly may be used with advantage. At that season I think a going-away hare should not be fired at when the distance is greater than 35 yards, unless this size of shot be used. At 40 yards or so, crossing shots at hares may, with confidence, be taken with a choked 12-bore and No. 4 shot. For walking up the strong wild hares met with in some districts, the ideal gun to my mind is a $7\frac{1}{4}$-lb. 12-bore chambered for $2\frac{3}{4}$-inch cases. With this type of gun and a charge of 47 grs. of amberite, and $1\frac{1}{4}$ oz. of No. 4 or No. 3 chilled shot, winter hares may be killed with certainty at 45 yards.

Of gunnery in connection with the shooting of rabbits, I doubt not my readers are fairly familiar. Many people in this country, young as well as old, whose inclination leads them sportwards, are more or less intimately acquainted with the shooting of the ubiquitous rabbit.

The shooting of rabbits goes on summer and winter. In summer the half- or three-quarters-grown young rabbits are stalked and killed by means of the rook-rifle or the shot-gun as they come out to feed on the herbage in the vicinity of their burrows. In autumn and winter, rabbits are shot in a variety of ways: by bolting them from their burrows with ferrets, by driving them out of thick grass or hedgerows, gorse, or pheasant covert by means of spaniels or beaters; and in various other ways.

Many people will tell you that No. 6, or may be even No. 7 shot, is the size for rabbits. But don't believe them—No. 5 is much better and more decisive in its effect upon Master Bunny. Any change from this should be in the direction of a larger size. Mr.

R. J. Lloyd-Price recommends $\frac{3}{4}$ oz. of No. 3 shot as a most effective dose for rabbits. He, certainly, knows what he is talking about, for on his estate the rabbit shooting is exceptionally heavy, the record bag of 5086 rabbits having been killed thereon by ten guns in the course of one day's shooting.

A great factor of success in shooting is a good cartridge.

In Chapter VI, I have attempted to give the fruits of my investigations concerning the ammunition issued by one of our principal makers; but of course there are other manufacturers of first-rate cartridges.

For years I shot exclusively with Messrs. Eley's cartridges, to the excellence of which I can testify; and this firm to-day maintains its world-wide reputation for reliability.

Messrs. Joyce also are well-known caterers for the modern shooter, and I learn that their new solid ejector cartridge-case is giving satisfaction, although up to the present my trials with it have not been exhaustive.

MIXED BAG.

CHAPTER XVI

WILDFOWL SHOOTING IN GREAT BRITAIN

The Various Species—Guns and Loads.

WITH regard to the guns suitable for each phase of sport, a broad line of demarcation may be drawn between the shooting of game birds and the shooting of purely feral migratory fowl such as geese and ducks.

In the case of game guns, the choice of bore is not entirely a question of utility, it is also in some degree one of sentiment. In game shooting the killing of but one bird with one discharge is a recognized canon of sport. The consensus of opinion having decided that the 12-bore accomplishes this rather better than the smaller bores, sentiment steps in and asserts that in a general way it must be considered unsportsmanlike to use any larger bore for the purpose.

This is not so with regard to wildfowl shooting, for here practically the only limit with regard to size is the gunner's ability and inclination to wield and carry the bulk and weight inseparable from heavy guns and their ammunition, as also to withstand that increased recoil which is the natural result of heavy discharges.

In wildfowl shooting heavy guns and charges are considered permissible on the grounds that the birds congregate together more or less thickly, and are exceedingly difficult of approach. Therefore, as the gunner's chances of a shot are infrequent, and the ranges fired at greatly exceed the distances at which grouse and partridges are killed, it is considered sportsmanlike to make the most of each opportunity by using larger guns, heavier charges, and by killing as many birds as possible at each discharge. There is just one exception to the latter remark; in shooting home-bred wild ducks on preserved ground, the sport is conducted similarly to pheasant or other driven-game shooting, the gunner picking out his birds and aiming to kill but one at each discharge.

In Chapter V, I have given tables showing the different bores of wildfowl guns, with their charges and so forth, therefore in the present chapter I name the size of gun and of shot best suited for killing each kind of fowl as discussed.

Practically all shoulder wildfowl guns at the present day are more or less choked. A cylinder-bored wildfowl gun may now and again be seen; these guns, however, are designed for some special work, such as flight shooting where ducks come in close; or, it may be, are so bored because it is desired to fire wire cartridges therefrom. Still, for most purposes of daytime sport with the wildfowl, I look upon close shooting in the wildfowl gun as absolutely indispensable, whether that close throwing of the shot pellets is obtained by means of the choke or the wire cartridge.

Some four or five species of wild swan have been known to visit these islands. Of these, four are European: the MUTE SWAN (*Cygnus olor*), the POLISH SWAN (*C. immutabilis*)—a very rare visitor which only in recent years has been recognized as specifically distinct from the mute swan, the WHOOPER SWAN (*C. musicus*), and BEWICK'S SWAN (*C. Bewicki*). The other is a North-American species, the TRUMPETER SWAN (*C. buccinator*), a very large bird with a wing stretch of about 8 feet. The common AMERICAN SWAN (*C. Columbianus*) may possibly, like that previously named, get so far out of its reckoning as to touch our shores on journeying southward in the autumn. As to this, however, I have no proof, although at least one visit of the trumpeter swan appears to have been established, for four birds of this species were shot on the Suffolk coast in October 1866.

Of the European wild swans met with here in winter, the first of those above named is, of course, the familiar swan of our rivers and ornamental waters. The mute swan exists in a perfectly wild state in territory adjacent to the Baltic Sea. Thus it is not singular that they should occasionally visit the coasts of this country. In fact, it is a matter for surprise that this swan is not a regular and frequent visitor. This probability notwithstanding, it is worthy of remark that, whenever a mute swan is shot on our tidal waters, it is more often regarded as escaped from confinement than as a truly wild visitor.

The WHOOPER SWAN has acquired its name from its loud call-note. It is the true wild swan of our islands, and is probably most familiar to the wildfowlers of our eastern coasts. It is a large bird, when fully grown measuring 5 feet in length, and across the wings from tip to tip upwards of 7 feet. When in good condition the male swan weighs 21 lb. or so, the female about 19 lb. Old birds are of snow-white plumage. The cygnets are greyish-brown for the first year, and do not acquire the complete white plumage of adult birds until they are eighteen months old or more.

BEWICK'S SWAN is found in greater numbers in Ireland than elsewhere in the United Kingdom. It is considerably smaller than the whooper, large birds measuring only 4 feet or thereabouts from point of bill to end of tail, and weighing from 9 to 13 lb. The plumage of adult Bewick swans is white; the cygnets are greyish-brown until they are two years old.

Wild swan shooting is not a sport that may be indulged in with any great frequency. These birds do not visit our coasts with the same regularity or in the same numbers as the grey geese, brent geese, wild duck, wigeon, and the like. In mild winters few swans will appear, and the shore-gunner may go through a whole season without seeing a single wild swan. Given hard weather conditions on the coasts of Scandinavia, Denmark, Germany, and Holland, accompanied by a strong easterly wind, wild swans will then come over here in greatest number.

The best of the shooting at wild swans is usually obtained in the shallow waters on the open coast, and in the wider estuaries and bays. In such situation their pursuit necessitates the use of a boat of some sort or other. This may take the form of a small sailing-craft of very light draught—say, barge-built and with a centre-board—or the single- or double-handed gunning punt. I have cruised about along the coast for days together in a small yacht of light draught in pursuit of sea-going wildfowl. This, if not altogether the most successful method of approaching wildfowl, is certainly the most luxurious, as food and shelter are always at hand, and with a stout swivel gun rigged up in the bow of the boat birds of one kind or other may frequently be bagged.

Few amateur wildfowlers care to endure the hardships inseparable from the pursuit of wildfowl in a single-handed gunning punt, notwithstanding the delights and excitements of this fascinating phase of sport. Moreover, it is a rather risky proceeding unless one has spent some considerable time in learning how to manage these small craft in a wind-swept tide-way on the open coast. For those who have not served this apprenticeship, the better plan will be to proceed to work in a double-handed punt accompanied by a man well versed in the nature of the waters to be shot over, the set of the tides, and the local weather conditions. In this way excellent sport may be enjoyed, and with a gun carrying 1 to $1\frac{1}{2}$ lb. of shot some good shooting can be accomplished.

Messrs. Holland & Holland, of New Bond Street, London, are foremost amongst the makers of punt guns. For solidity, strength, and simplicity, the "London" breechloading punt gun of this firm is undoubtedly one of the finest of its class. It is on the central-fire principle, with falling breech-action, and for ease and speed of loading, of extraction, as also of manipulation generally, this gun stands as a splendid example of gunmaking craft and ingenuity. This punt gun has a steel barrel chambered for either solid metal or paper cases, and is made in all sizes from $1\frac{3}{8}$- to 2-inch bore, and having regard to the high quality of the materials and workmanship, the prices charged for these guns are not by any means excessive.

When following swans with a punt gun throwing a pound or more of lead, the sizes of shot known as "AAA," of 32 pellets to the ounce, or "AA," of 40 pellets per ounce, will be found effective up to about 80 yards. For shooting at lengthier ranges, mould shot will have to be used; "SSG," of 15 pellets to the ounce, is a most useful size, and with this weighty shot swans may be killed at 100 yards or over.

With heavy shoulder guns of 4-bore or 8-bore, "AAA" or "AA" may be used with effect on swans up to 50 or 60 yards. For longer distances "SSSG" mould shot, of 17 pellets per ounce, may be employed. In any case it will be well to carry out a few experiments at the target in order to ascertain the gun's performance with these large sizes, when probably it will be found that the shooting may be slightly better with one size than another.

Of wild geese common to the British Islands there are six clearly-defined species—

1. The Greylag Goose (*Anser cinereus*).
2. The White-fronted Goose (*A. albifrons*).
3. The Bean Goose (*A. segetum*), or (*A. arvensis*).
4. The Pink-footed Goose (*A. brachyrhynchus*).
5. The Bernicle Goose (*Bernicla leucopsis*).
6. The Brent Goose (*B. brenta*).

The first four on this list are land-feeding fowl, the two latter are usually found in proximity to the sea, the brent goose being strictly a saline feeder.

The chief points as assisting to identification of species in respect of our grey geese is the coloration of their bills and feet. With regard to the grey geese, especially the bean and pink-footed, hypercritical enthusiasts have divided and sub-divided until the wildfowler looks askance at the list so greatly swollen by the addition of new names. I have noticed several remarkable variations to occur in respect of size and other features amongst the scores of grey geese I have shot.

In some specimens more or less striking departures are to be noted from features considered to be typical of individual species, particularly in the formation and contour of the bill and its colour, as well as in the colour of the plumage, legs or feet. I myself have shot pink-footed geese with certain variations in the form of the bill, and degrees of its coloration. Some have had the outline of the mandible hollow, whilst others have had this upper line decidedly convex. In one goose this convexity, or aquilinity, was so remarkable that some friends at once dubbed the bird "old Roman nose." Also, I have noticed the feet and legs of the pink-footed goose in various shades of colour, from rich brilliant red to pale fleshy pink—I am speaking of fresh-killed birds, *i.e.* as picked up on being shot, and not faded specimens that have been kept for days in the flesh, or, worse still, cured skins housed for years in the dry musty atmosphere of some museum.

Other geese, both bean and pink-footed, that I have shot have had a clearly-defined frontal margin of white feathers at the base of the mandible, and in some birds this has been fairly broad.

As uncommon and accidental visitors to our shores, the following wild geese may be named—

1. The Canada Goose (*A. Canadensis*).
2. The Red-breasted Goose (*A.* or *B. ruficollis*).
3. The Lesser White-fronted Goose (*A. erythropus*).
4. The Snow Goose, of which species a large form (*A. hyperboreus nivalis*), and *A.* (or *Chen*) *hyperboreus albatus*, a small form, are generally recognized.
5. The Egyptian Goose (*Chenalopex* (*Anser*) *Egyptiacus*).

So many Canada geese have been introduced here that it becomes an extremely difficult matter to determine whether geese of this species found at large in this country are truly feral or merely semi-domesticated. The Canada goose is a bird of fine proportions, for it sometimes attains to a weight double that of some of our middle-sized grey geese.

The red-breasted, or Siberian goose, is a strikingly handsome bird with tri-coloured plumage composed of rich chestnut, glossy black, and snowy white. It is about the size of the brent goose, and has been obtained about a dozen times in Great Britain.

The lesser white-fronted goose, which is said to be distinct from its larger namesake, has only once been identified as occurring in England.

Mr. Howard Saunders was the first to chronicle the appearance of snow geese in these islands, he having obtained two dead birds from the Leadenhall Market, London, in 1871, these having been shot in Ireland. As recorded in the *Field* of January 1891, I saw three snow geese fly over my house in Yorkshire on January 16 of that year. Six days subsequent to that date, the late Rev. H. A. Macpherson also saw four snow geese in Cumberland. The snow goose may be readily identified at a considerable distance, as it is pure white with black tips to the wings.

The Egyptian goose—like that big fellow placed first on the above brief list—has long been acclimatized here, and so possibly the shore-shooting wildfowler may occasionally come across birds of this species that have escaped from private waters. Still, it is not without the range of probability that some truly wild Egyptian geese may be met with in this country.

The greylag is the only wild goose which breeds in Great Britain. It is also the largest of the British grey geese, measuring from 33 to 35 inches from point of bill to end of tail, and weighing up to 10 lb. or more. It has flesh-coloured bill, legs, and feet, and black claws.

The bean goose is next in size, its length being about 32 or 33 inches. Naturalists now tell us that the yellow-billed bean goose, *A. arvensis*, is our commonest species. *A. segetum* has a black bean or nail on the point of the bill, the middle portion of the mandible being orange, with black at the base; the legs and feet are orange, and claws black. I have shot bean geese weighing up to 8½ lb.

In the pink-footed goose, the feet, legs, and middle portion of the bill are pink; the nail and base of the bill, as also the claws, are black. Length, about 30 inches. Usual weight, 6 to 6½ lb., but I have shot them weighing up to 7¾ lb. after a long course of stubble-feeding.

The white-fronted, so-called from the white feathers on its forehead, is the smallest of our grey geese, measuring about 28 inches in length. The nail on the bill is white to yellowish-white in adult birds, in yearlings it is light brown; the claws are whitish horn colour. The rest of the bill and the legs and feet are yellow to orange.

The bernicle goose is beautifully barred with black and lavender-grey on its back; the head and neck are glossy black, cheeks are white, and there is a good deal of white on the under parts. The bill is short and black, and this, too, is the colour of the legs and feet. Length, about 25 inches. Good birds weigh about 5½ lb.

The brent is the smallest of our geese. There are two forms of this bird, the dark-bellied, the commoner species, and the white-bellied brent (*A. brenta glaucogaster*), the larger bird. There is so much of black or dark colouring about the head, neck, and other parts of the plumage that these birds are known as black geese among the professional gunners on some parts of the coast. Brent geese measure about 22 inches in length, and their bills, legs, and feet are black, a white band of feathers partially encircles the neck.

Of all our wildfowl brent geese are amongst the most wild and unapproachable, and yet this trim little goose is far from being a coward; when fairly cornered I have found him to be a brave little fellow. On a certain part of our coast, where I have spent many delightful hours chasing the wildfowl or standing duck-flight, the tide recedes three miles or more, leaving thousands upon thousands of acres of wet, though firm, sands. Over this aqueous *terra firma* some few fishermen drive their carts down to low-water mark, whence they bring home shrimps and cockles. One hardy family, comprising three living generations, has been pursuing this vocation many years. Long practice enables these men to find their way on the darkest winter morning, or through the thickest fog. I sometimes accompany them on their cold drive, and one day whilst so journeying, the conversation turned upon the brents, or black geese as these birds are locally known, whereupon one member of the family told me a wonderful story. He said that when down at low-water one very foggy day, a small bunch of brent geese came and alighted on the water-edge close by. Just out of curiosity, and having no gun, he thought to drive his cart along to see how near the geese might suffer him to approach, and was greatly astonished to find that the brents were so exceeding loth to take wing in the fog that they sat until the horse was well among them, whereupon one member of the group—to use the fisherman's expression—"fair set himself at my old horse and sissed at him."

Lest some of my readers, to whom the shyness of the brent goose is a more or less familiar feature, should be inclined to doubt the veracity of my informant, I may tell of another incident, which, to my mind, wholly confirms this tale. One morning this last winter, 1905–6, I went into the yard adjacent to the house of one of the fishermen for the purpose of viewing certain fowl caught in their flight-nets. These flight-nets, by the way, are stretched along the shore on that coast for hundreds upon hundreds of yards, and in these nets, more especially on dark nights, a great variety of birds are caught—grey geese, brents, duck, wigeon, curlew, knot, dunlin, and gulls of various kinds, and I have seen also short-eared owls and a peregrine falcon caught in this way. On that particular morning I found a solitary brent goose, some black-headed gulls, and a few knot in the pen of wire-netting in which the captured birds are placed. Although only caught a few hours previously, this brent goose reared himself up on my approach and hissed loudly. Determined to see how far he might be overawed, I pushed my finger through the wire-netting, and instantly the pugnacious little chap came up and gave my finger a most determined and vicious nip with his powerful bill. After that I decided to accept in its entirety my fisherman friend's story of his adventure with brent geese in a fog.

I find some considerable diversity of opinion amongst goose shooters with regard to the most effective sizes of gun and shot to use for the killing of these tough fowl. If one could insure hitting a goose in the head or neck, there is little doubt that a 12-bore gun with No. 3 shot would prove a very deadly combination up to 60 yards. But with the truest aim and the best intention possible, the shooter cannot insure thus striking his goose at that range, as the really vulnerable parts, the brain and spinal column, there present but a very thin line as a target. Therefore, for long-range work—and most goose shooting is of this nature—the practised goose shooter realizes that he must rely more or less upon making the body of the bird his principal objective. The body of a goose is well protected with strong feathers and thick down, and as a large amount of muscular tissue will also have to be pierced before any vital spot can be struck, considerable penetrative effect must be displayed by the shot pellets, in order to secure the most promptly fatal results.

For punt guns carrying a pound or so of shot, "AA" will be found a thoroughly effective size to use upon gaggles of geese up to 100 yards. At distances greater than this, "SSSG," of 17 pellets, or "SSG," of 15 pellets to the ounce, may be used with more or less effect.

In single shoulder 4-bores, throwing from 3 to 4 oz. of shot, I have found "AA" a reliable size. With a gun of this calibre and $3\frac{1}{2}$ oz. of "AA" shot I once cut down five pink-footed geese at

96 yards, three of the birds falling as dead as the proverbial door-nail. For goose shooting at lengthier ranges, "SSG" may be tried in 4-bores.

A double 8-bore is an extremely useful weapon for the goose shooter. One that I have shot with a good deal is a one-trigger hammerless gun by Westley Richards, and whilst weighing but 13½ lb., a charge of 104 grs. amberite and 2¾ oz. of large shot is fired from it quite comfortably. It is a paper-case gun, and, in the light of our present knowledge, may be regarded as having reached the acme of power and deadliness in its particular class. For shooting geese with guns of this size, "BB" shot will be found effective up to 60 yards; beyond this distance, and up to 90 yards or so, "AA" may be used. For shooting at 100 yards or over, mould shot will prove more deadly, but care must be exercised to insure selection of the size best suited to the boring of the gun; "SSSG" might answer well in one gun, "SSG" better in another.

The 10-bore for goose or duck shooting should weigh from 9 to 10 lb., have fully-choked barrels 30 inches long, and shoot charges of 70 to 80 grs. of K.S. or amberite, 1¾ to 2 oz. of large shot. Up to 50 yards, "B" shot will answer for geese in guns of this calibre, beyond that range "BB" or "A" shot.

The long-chambered 12-bore makes a very effective and thoroughly handy tool for night shooting. With such gun, weighing about 7¼ lb. and throwing but 1¼ oz. of shot, I have killed many grey geese by night. A favourite dose of mine for this work is "BB" shot driven by 48 grs. of K.S. or amberite, and it is a treat to see the way in which it crumples up geese at 40 to 50 yards.

I frequently use the smaller sizes of mould shot in 12-bores, but when doing so I first ascertain the size best adapted to the boring of the gun. In order to do this I push a wad into the choke, and then select the size of mould shot which packs most accurately, without undue tightness, in this constricted part of the boring. It is a somewhat tedious process to pack these slugs in this order in the cartridge-case; nevertheless, I believe the goose shooter will discover it to be time well spent, for, speaking from practical experience, I may remark that I have brought off some mighty shots with guns loaded with this mathematical exactitude.

Our wild ducks may be divided into two classes: (1) Surface feeders, and (2) Diving ducks.

The COMMON WILD DUCK (*Anas boschas*), the male of this species being widely known as the MALLARD, comes within the first category. Amongst all our wildfowl, the wild duck ranks first in importance, for, indubitably, it is one of the finest sporting birds that ever stretched wing, and, moreover, is well in the first rank as an edible commodity.

Within recent years considerable attention has been given to the rearing of wild duck upon inland shootings at greater or less distance from the sea. The young birds are much hardier and less difficult to rear than pheasants, and supplies of eggs can be obtained from several game farms at about half the cost of pheasant's eggs. In obtaining these care must be exercised to insure having only pure wild ducks, as half wild breeds do not fly so well. There are many estates in England, Scotland, and Ireland where the rearing of wild ducks might be prosecuted with considerable success. It is true that these birds, when strong on the wing, may fly away in the evening to feed on adjacent rivers or corn-fields, and so the owner's loss may profit the keen flight shooters of the neighbourhood; but, given agreeable surroundings and proper feeding at home, the shrinkage of stock from this cause should not be very great.

On some few large sporting estates in England and Scotland, where the rearing of wild ducks is carried out on a considerable scale, the best of sport is obtained with these strong high-flying fowl. On the estate of Sir Richard Graham, in Cumberland, where wild duck rearing is extensively practised, considerably more than one thousand wild ducks are frequently shot on each one of three consecutive days' shooting. Other shootings, notably those of The Mackintosh in Inverness-shire, and the Hon. Walter Rothschild in Hertfordshire, yield very large bags of wild duck. Now that the possibilities in the way of providing sport of the very highest order, furnished by the rearing of wild ducks, have come to be more widely realized, we shall doubtless soon see these examples followed elsewhere.

I have found some game shots, inexperienced in the shooting of wild duck, possess a most inadequate conception both as to the speed at which these birds travel through the air and the height at which they may be made to fly. As an eye-opener for the small-shot men, I may be excused for mentioning the following incidents which recently came under my notice. At a certain shooting of hand-reared wild ducks, all the guns but one turned up with No. 6 shot cartridges. The birds flew high and well, and few were stopped in proportion to the number of shots fired; in fact, I heard that one man, by no means a bad shot, emptied his first bag of one hundred No. 6 shot cartridges, and had but two birds down! The next day the pick-up comprised between thirty and forty dead and wounded birds, spread over a considerable area.

A short while afterwards a second shooting took place, and the ducks having gained in wisdom from their former baptism of fire, were again neither sluggish nor low. On this occasion, the host having apprised his guests of the necessity for using larger shot upon these high birds, No. 4 shot was the order of the day. This resulted in a marked improvement in the shooting and the resultant bag, and the following day only two birds were picked up by the keepers. *Verb. sap.*

For killing hand-reared wild duck, such as the foregoing, no shot less in size than the new No. 4½ mentioned in the previous chapter should be used in cylinder guns. A good cylinder with this shot gives patterns of 120 in the 30-inch circle at 40 yards, *vide* Chapter V. In a choked gun No. 4 shot may be used, and according to the table just mentioned a well-bored gun gives, with 1⅛ oz. of this size, a pattern of 121 pellets at 45 yards.

There are some phases of wild duck shooting where even the foregoing charges may prove insufficient for the work in hand. On some estates the wild ducks are trained to fly high by firing blank cartridges under them as they return to their home quarters. In such cases wild ducks quickly soar high up in the air, and larger shot must then be used. My recipe on these occasions is a full-choke 12-bore chambered for 2¾-inch cases, a fair charge of some good nitro powder, well wadded, and 1¼ oz. of No. 3 shot.

When shooting truly feral sea-going wild ducks on a coast much disturbed by constant bombardment of native flight shooters, I find that these wide-awake fowl require heavier metal than even the foregoing.

Last year I was discussing the question of killing these exceptionally high-flying wild duck with Mr. Leslie B. Taylor, the managing director of Messrs. Westley Richards. I told him that I frequently had to take wild duck at a height of 50 or 60 yards, or forego firing, and that under such circumstances an ordinary full-choked 12-bore could not be fully relied upon to cause their headlong downfall. Of course wild ducks in their winter clothing of thick down and strong feathers take a remarkably heavy blow to bring them instantly to earth when hit at the longer sporting ranges, and although a good shooting 12-bore of ordinary capacity will do fairly well at 40 yards, or, possibly, a bit over with No. 4 shot, something more powerful will be required if the sportsman desires to do thoroughly satisfactory work on wild duck beyond those distances. There is nothing more annoying to the capable gunner than to see his birds go away hard hit, flying, perhaps, half-a-mile or more before they come down. This is a source of much annoyance, as ducks so shot in the fast-fading light of a winter evening are seldom recovered. Some one may say, Why shoot at birds at such distance? and of course I agree that, in the abstract, the position is none too defensible. Still, it is a very easy matter to draw hard-and-fast lines whilst discussing these matters in the smoking-room, but in those situations where little shooting is to be done save at 50 yards, all such over-night resolutions are apt to be more honoured in the breach than the observance by those gunners who are not mere nerveless, passive automata.

I therefore, as stated, consulted Mr. Leslie Taylor, a practical and capable adviser on all matters connected with the construction and performance of gun or rifle, and I suggested the building of what may be termed a high-velocity or express 12-bore shot-gun for the purpose of killing these high wild duck and, generally, of wild game. He responded with characteristic breezy alacrity, and in the course of a few weeks sent me what, in many respects, proved itself the most wonderful gun I have ever shot with.

This gun weighed about $7\frac{1}{2}$ lb., had 28-inch barrels with exceptionally strong breeches and action; indeed, he assured me that I could not burst the barrels nor break the action by any charge that can be got into a $2\frac{3}{4}$-inch cartridge-case or of which I cared to withstand the recoil. This guarantee was an important consideration, in view of the fact that the cartridges sent with the gun contained exceptionally heavy charges of a certain nitro powder; charges that would, I am certain, give many 12-bores a very bad shaking.

I am not by any means satisfied that the best charges, by a long way, have as yet been devised for this special gun; in fact, I am confident that even better loads may yet be found. Nevertheless, with the charges so far employed, I have made truly remarkable shooting with this high-velocity 12-bore. Extremely long shots at wild duck have been frequently taken purposely to test the powers of this gun—shots that long practice tell me it would have been useless to attempt with 12-bores of ordinary boring and construction. I have constantly been amazed to see the remarkable deadliness of the shooting accomplished by this gun at extreme ranges. At a height of 50 yards a wild duck begins to look small; but I am positive that I have brought down ducks stone-dead, from this altitude, and friends out with me have constantly remarked upon the extraordinary height at which this gun reaches its birds, and the truly decisive manner in which it cuts them down. I purposely loaded some cartridges with single "B" shot to further test the ranging powers of this gun. Then I found that with the gun held well forward ducks tumbled down headlong from well-nigh incredible heights—distances that no practical shot would think of firing at with ordinary 12-bore guns and loads.

I am convinced that on several occasions birds must have been brought down from a height of close on 180 feet. It was astonishing to see these big mallard and duck shut up suddenly like penknives and drop headlong from this height, the time it took them to reach the ground being not the least remarkable feature about the entertainment, for it gave one ample time to take in the scene. It was, further, worthy of note that in practically every instance the birds had not a kick left in them when picked up, the weighty shot pellets driven at such extremely high velocity had done their work well and cleanly, though doubtless any little life that might have been left in the ducks would be completely knocked out by the terrible thump received on hitting the ground.

It is, I think, unquestionable that the shooting of flighting wild ducks is the finest and most exhilarating of any form of sport that is offered to the shot-gun in this country. I am, of course, speaking of overhead wild ducks; the shooting of these birds rising from dyke, stream or marsh is no more exciting than the killing of grouse, partridge, or pheasant springing in front of the gun.

The shooting of pheasants driven from a hill over guns posted in a valley may be compared, and not unfavourably, to the sport afforded by hand-reared wild duck, save for the fact that the latter may be trained to offer lengthier shots and alter their course more than do pheasants on seeing the gun.

In modern game shooting, however, there are indeed few, if any, parallels to be found at all comparable to the shooting of strong flighting wild ducks moving at great speed high overhead through the gloom of a wintry twilight. The nearest that I can call to mind is the killing of tall pheasants crossing some drive or narrow clearing in high timber.

In shooting flighting wild ducks under these conditions, the area of vision is so circumscribed by the gloaming light that the time for action is often reduced to the narrowest possible limits. No sooner is the whistle of approaching wings borne upon the shooter's ear, than the ducks are on him like a flash. Under these conditions the most alert and ready shots are frequently at a loss to make really effective use of their second barrel. So situated, I find the one-trigger, as affixed to my gun by Westley Richards, materially assists me in overcoming this difficulty, owing to the rapidity with which the second discharge may be effected. Moreover, as this arrangement assures the grip of the right hand upon the stock remaining constant, the second barrel may be fired with increased steadiness and deadliness of aim. In fact, as I recently apprised my gunmakers, I consider it is no exaggeration to say that under these conditions this one-trigger increases the efficiency of the second barrel by at least 50 per cent.

This form of winter duck flighting engenders a wonderful fascination in its votaries, to whom there is no music equal to the shrill resounding whistle of a wild duck's wings, the quick rush of a headlong descent, and the resounding "thud" of a heavy body striking the marsh thirty or more yards away. Night by night, for weeks together, these past few seasons have I walked five miles each way to and from the duck-flighting ground, and on some occasions merely for the pleasure of seeing and hearing the fowl. Sometimes the ducks flew too far to the right or left hand, as it might be; at other times they were indiscernible in the gloom, or, possibly, fog.

But, all the same, the succeeding afternoon saw a keen gunner or two undertaking the same ten-mile tramp—and the more heavily laden they, the shorter seemed the homeward journey, for there was then much to discuss respecting their past all-too-brief period of keen excitement.

I have shot grouse, pheasant, partridge, woodcock, and snipe; I have shot deer and the wily wild goose, and find there are few forms of sport to which my soul reverts with so great and keen desire as to the shooting of flighting wild duck and wigeon in the stormy winter twilight.

Next in importance to the common wild duck comes the WIGEON (*Anas penelope*), the most abundant of the saline surface-feeding ducks. Some few wigeon nest in Scotland, but these are as nothing compared with the thousands which flock to our coasts in autumn and remain through the winter.

These fine sporting ducks, with the wild ducks and the brent geese, are the chief objects of attraction to the punt gunner. Wigeon usually commence to arrive about Michaelmas, and thence onwards for two or three months they continue coming, in greater or lesser numbers according to the direction of the wind and the mildness or severity of the weather in northern continental waters. The length of the wigeon is 18 or 19 inches; weight varies, according to condition, from $1\frac{3}{4}$ to 2 lb. or over.

In the punt gun carrying a pound or so of shot, single "B" and No. 1 are suitable sizes for the shooting of wigeon. For heavy shoulder guns, No. 1 shot, and in full-choke 12-bores, the most decisive effects are likely to be obtained from the use of No. 3 shot. Wigeon flighting is very fine and most exciting sport, and when the birds come singly the shooting must perforce be quick and true to bag many. These birds pack more closely together in flight than do wild ducks, and now and again at flight, a well-directed shot from even a 12-bore will cut down two or three birds.

The PINTAIL (*Anas acuta*) is not a common species, although wintering here pretty regularly. The male pintail has a long and finely-pointed tail, and on this account is termed "sea-pheasant" by the professional punt gunners and fishermen in some districts. Owing to this caudal elongation, the drake measures as much as 28 inches from bill to tail, the tail of the female is not so long, although decidedly more pointed and lengthy than others of the duck tribe. They are excellent table birds, and at their best will weigh up to 2¾ lb. Pintails are sometimes found associating with wigeon, and the guns and sizes of shot recommended for killing the latter will answer right well for the shooting of pintail.

The TEAL (*Anas crecca*) is a sprightly little duck measuring only some 14½ inches in length, and weighing up to 14 oz. Although the least amongst our wild ducks, it ranks high in the estimation of the sportsman as a truly excellent sporting bird. Teal possess remarkable powers of flight, they spring from ground or water like rockets, and a single teal whizzing overhead like a cannon-ball in the dusk of an autumn evening proves a veritable teaser to the most skilled flight shooter. Teal nest here in fair quantity in certain districts, and the encouragement they are now receiving on various sporting estates may, it is to be hoped, result in some considerable increase of the number of these game little fowl.

The 12-bore is the most satisfactory weapon for the inland shooting of teal, and, all things considered, and taking shots long and short, No. 5 is the most serviceable size of shot to employ. When the punt gun is used, No. 2 or No. 3 may be used with telling effect.

The GADWALL (*Anas strepera*) and the SHOVELLER (*Anas clypeata*) both breed in this country, but are not sufficiently common to warrant the writing of any special instructions for their shooting. The wildfowler meets with either species only at irregular or in more or less infrequent intervals, and on doing so may use similar guns and ammunition to those employed for the killing of the common wild duck.

The Sheldrake or Shelduck (*Tadorna cornuta*), although a big and strikingly handsome bird, is of small account from a sporting standpoint, and is, moreover, of small edible value. In carriage and flight the sheldrake is more gooselike than ducklike in appearance. Shelducks nest in some quantity in the rabbit-holes in the sand-dunes not far from my home, and although scores of them are to be seen on the coast in the autumn, I very rarely pull trigger on them. Sheldrakes weigh from 3 to 4 lb. or about the same as brent geese, and are slightly longer, for they measure 24 to 26 inches from point of bill to tail end.

Of the diving ducks there are some nine species : the Pochard (*Fuligula ferina*) and Tufted Duck (*Fuligula cristata*) are best worth the consideration of the wildfowler from both the sporting and the gastronomic standpoint.

Pochard are about the same length as wigeon, but weigh considerably more than the latter, for in good condition they reach up to 2 lb. 6 oz. At some points along the coast there is fair sport to be obtained at morning and evening flight with the pochards. They are pretty tough fowl, and I find No. 3 shot in a 12-bore, and No. 2 or No. 1 in a double 8-bore, not too large sizes of shot to use for effectually stopping them. When feeding on inland pools and lakes pochard are good eating, as are tufted duck. The tufted duck, so-called from its occipital crest of feathers, which in some birds is 3 inches long, weighs about 1¾ lb., and is 17 inches from bill to tail.

Under some conditions of food-supply, the scaup duck is not at all bad eating. I remember once raking a strong gang of these birds as they crossed the bows of a small sailing-boat I was aboard, bringing down ten of them with a 4-bore and 3½ oz. of shot. This completes the list of the diving ducks really worth the wildfowler's consideration.

The Long-tailed Duck (*Fuligula glacialas*), which must not be confused with the pintail, and the Golden Eye (*F. clangula*) are sometimes followed with an infinite amount of gusto by the collector ; they, however, are seldom the recipients of much attention from the true wildfowler.

The EIDER DUCKS and the SCOTERS are practically worthless from the standpoint of sport.

Next in importance to the ducks come the plovers. Of these the GOLDEN PLOVER (*Charadrius pluvialis*) is both a fine sporting and an excellent table bird. Its length is about 11 inches, and weight, 8 to 10 oz.

The LAPWING or GREEN PLOVER (*Vanellus cristatus*) is also a popular sporting favourite, and by some people is not considered inferior to the golden plover as an edible quantity. This bird's egg is the *bonne bouche* of the gourmet.

The GREY PLOVER (*Squatarola helvetica*) is a more shore-frequenting bird than the two last named. On that account it is known in certain districts as sand plover. In other parts it is often styled silver plover on account of its plumage, it being speckled over with whitish spots in the same manner as is its golden relative with yellow spots.

For shooting these birds with shoulder guns, No. 3 shot may be recommended in 8-bores, whenever they are moving about in sufficient numbers to warrant the use of so large a gun. In 12-bore guns No. 5 shot will generally serve the purpose of the plover shooter.

One of the most important amongst the larger shore birds is the CURLEW (*Numenius arquata*). This long-billed fowl sometimes reaches a length of more than 2 feet, and a fair average weight appears to be about $1\frac{3}{4}$ lb., although I have shot them weighing $2\frac{1}{2}$ lb. On ground much shot over, the curlew is an extremely wary bird, and by reason of his length of leg and remarkable powers of vision, he can see a long distance around, and seldom fails to frustrate the insidious "advances" of the crawling shore shooter.

The WHIMBREL (*Numenius phæopus*) also has a curved bill, and much resembles the curlew. It is known as "Curlew-jack" and "Half-curlew" in some districts. Length, 16 to 18 inches; weight, from 12 to 16 oz.

The BAR-TAILED GODWIT (*Limosa rufa*) and the BLACK-TAILED GODWIT (*L. ægrocephala*) are seen here whilst migrating to or from their breeding grounds. The former is the smaller and the commoner of the two, but it now seldom appears in sufficient numbers to call for the serious attention of the shore shooter.

The Redshank (*Totanus calidris*) is a common shore bird, and in some quarters proves a positive nuisance from its loud call-note of alarm. This it never fails to utter on seeing the wildfowler, and so thoroughly arouses all the wildfowl within hearing distance. On this account sportsmen in the Lincolnshire Wash district have conferred on this bird the title of "policeman."

The Knot (*Tringa canutus*) is the most valuable from a culinary point of view of all the smaller shore birds. Huge flocks of knot, thousands strong, are frequently to be seen on the flat seaboard of the Wash, where, feeding only on the tide-laved silt or mud flats, they are invariably as plump as partridges. A good rake into a flock of knot with both barrels of a 12-bore may often secure a dozen or more. With an 8-bore, and No. 3 shot, a heavy shot may now and again be made, and then some old fisherman on coming up to help you recover the runners, will remark, "That's the way to mow a lane thruff 'em, master."

The wild pigeons of these islands are capable, on occasion, of affording as fine sport for the gun as any other birds we have. Wood-pigeons flighting high over the tops of tall trees in a strong wind present a form of shooting as difficult as the most skilled gunner can wish to encounter, and few birds are more difficult to hit than the cliff pigeons—both rock-dove and stock-dove—as they dart and twist from out of their rocky haunts on the coast. Pigeons require a heavy blow to bring them down, and nothing less than No. 5 shot is of much use for them.

CHAPTER XVII

THE SPORTSWOMAN: HER RATIONALE IN THE FIELD AND HER EQUIPMENT

DURING the last decade or so the number of women shooters has continually increased, and probably twenty women shoot to-day where one did before. It is a pleasing thought that the love of sport so long a characteristic of the Englishman is now being increasingly shared by his womenkind.

It is not part of my task to discuss the pros and cons of ladies in the shooting field, nor whether as sportswomen in relation to their position in the social scheme any serious ethical principle is involved. I am prepared to accept their position as an established fact, and to recognize when they take a gun in their hands that to a delight in nature they may add an intelligent display of skill in marksmanship.

Some who have discussed the presence of ladies in the field have argued from too narrow a view, asserting that hypersensitiveness is too often exhibited, and a capacity for "voluminous chatter" (I think it has been called) given the freest play.

But in my experience this does not fairly represent the type of woman with a love for sport who is ambitious to shoot; and without doubt a desirable number take to shooting because they possess characteristics and temperaments the reverse of those forming the subject of complaint. After all, women who take their sport seriously will be treated seriously by men.

As women so frequently participate in other sports, such as hunting, cycling and fishing, becoming adepts in all, and, furthermore, in many instances even outrivalling the achievements of the sterner sex, there is to the impartial mind no factor which could lead one to argue that they should not bring to the shooting field the same enthusiasm, and attain the same proficiency which they show in other fields of sport.

Modern improvements have rendered easier their *entrée* into the sporting arena, foremost amongst these is smokeless powder, which, besides being cleaner than black gunpowder, has reduced recoil, and thus permitted the use of much lighter and handier guns. Recoil is frequently the *bête noire* of the novice, and this whether the subject be a sparsely-built man or an average woman. The old recoil given by black powder under such circumstances punished certain people to a degree which would be regarded as objectionable by the lustiest sportsman of to-day. This physical objection, together with the subsequent headache which more or less affects certain sportsmen even when using smokeless powder, often held back the aspiring sportswoman from venturing upon the practice of shooting or gave a rude check to her hasty enthusiasm.

Moreover, at that date knowledge and experience concerning the most suitable model of the sportswoman's gun, its stock, shape and measurements, were necessarily limited, and ardent sportswomen of the past have doubtless suffered from weapons so ill-fitting as actually to increase to the verge of severity the existing unpleasantness of recoil. And this was so even though light guns and small charges were used.

Now-a-days, to the enormous advantage accruing from lighter guns shooting smokeless powder, we can add the improvement in constructing guns on rational lines to suit a woman's build and needs ; and with such improvements there is no reason why the regiment of women shooters should not in the course of time become a respectable army.

Like men there is no doubt they have the same instincts, and the same outlook as regards the killing of game. The equality of their position in this matter is proved, I think, from the fact that all sportsmen hate to wound and prefer to kill. In this we have the simple humane instinct which recognizes that to cause pain is an unnecessary part of sport ; the delight in the chase and in the contest of man with his prey forming the real excitement of shooting.

If these facts be accepted, women shooters, from their very nature, will approach the subject from the same standpoint, and on these grounds I believe it to be the duty of all sportsmen to encourage lady shooters and to make their companionship in the field all the more delightful by helping them to pursue the sport of shooting in as manly a spirit as possible, and to kill clean.

The battle of the bores, or the question as to the superiority or otherwise of the 12- and 16-bore, which has been carried on for the past thirty years, has given the victory to the 12-bore so far as men are concerned.

In these days the discussion seems to us somewhat superfluous, and this no doubt because we have to meet different and easier conditions. If, like our forefathers, we were compelled to use black powder and had to construct our weapons of sufficient weight to withstand the heavy recoil given by this powder, we should express no surprise at the agitation then set on foot for the purpose of meeting the difficulty of recoil by a gun of smaller bore and consequently of lighter weight, which became all the more comfortable to shoot by reason of the reduced powder and shot charge employed.

In the days we are speaking of the 12-bore gun had perforce to weigh at least $6\frac{3}{4}$ lb., and many guns of this bore weighed even 7 lb. or more; and yet they were constructed and regulated for only 3 dr. of black powder and $1\frac{1}{8}$ oz. of shot. It is true that occasionally $1\frac{1}{4}$ oz. of shot was used. Such a weight of gun for a normal charge was unduly cumbersome and fatiguing; moreover, many sportsmen, notwithstanding the heavy weight in comparison with the load, used to complain of violent recoil. Indeed, instances are recorded of many sportsmen who, to obviate this unpleasant recoil, had recourse to a 16-bore charge for their 12-bore guns, the charge being $2\frac{3}{4}$ dr. of black and 1 oz. of shot.

Thus we see that the old order of things presented two serious difficulties: first, the heavy weight of the gun, and second, undue recoil. In order to remove the difficulty of weight some authorities advocated the 16-bore. This arrangement both lessened weight and recoil as compared with the 12-bore gun when using its full game charge, 3 dr. and $1\frac{1}{8}$ oz.

The weight of the 16-bore gun of that day was $6\frac{1}{2}$ lb., or practically the weight of a modern 12-bore, although there is no doubt that the recoil of this 16-bore gun with its black powder charge was slightly heavier than that of a modern 12-bore using a normal charge of nitro powder and shot.

We see from the foregoing statement that the advocates of the 16-bore in those days had full warranty for their position. No one may dispute the fact that a 7-lb. gun of 12-bore and a black powder charge form a very unpleasant combination for the game shooter. Nevertheless, the 16-bore, although popular in some circles, never came into general use, from the fact that the lighter charge of shot employed involved a reduction of efficiency in the field as compared with a larger charge of shot fired from the

FIG. 205.—SIDE VIEW OF LIGHT 12-BORE GUN FOR LADY.

12-bore it was to supplant. Had it been capable of equal performance with the 12-bore, coupled with its other advantages, it would have rendered discussion superfluous, and the 16-bore would have gained the victory.

But its one shortcoming as compared with the 12-bore, although not of sufficient importance to outweigh the advantages it conferred, left just that weak spot for the attacks of its opponents, and thus it was that the vexed question of 12- and 16-bores seemed to have become a perennial theme of discussion.

Concerning the subject of game guns for women shooters, we derive considerable knowledge and guidance from the experience of sportsmen themselves and from the guns they use. The average 12-bore game gun, as we have seen, is admitted to be the best type of weapon for all-round sport in this country; it weighs about 6 lb. 10 oz., has 30-inch barrels, the right barrel cylinder and the left a modified choke. There are doubtless many varieties of this

Fig. 206.—Top View of Light 12-bore Gun for Lady.

type, in which exist modifications of the boring, length of barrel, weight, charge of powder and shot, but none of these constitute a vital deviation from the general pattern.

This gun may be said to suit the needs of the average sportsman; no man, as a rule, desires to have a lighter weapon, nor suffers any inconvenience on the score of recoil from a 12-bore gun of this weight shooting the normal load with nitro powder. But there are men and men, and certain temperaments on the part of some and physical characteristics of others necessitate lighter guns and lessened recoil. It is from such guns that we obtain that guiding information to assist us in forming definite and practical conclusions as to the best type of weapon to be recommended for women, weapons which they can handle with ease and comfort and with the highest effectiveness.

Guns of 12-bore have been constructed, and are being used with considerable success, which weigh under $5\frac{3}{4}$ lb., the barrels being 28 inches long. They are indeed capable of shooting the full 12-bore charge, and under modern conditions the recoil is not excessive. It is, however, to be recommended that such light weapons should be used with only 40 grs. of nitro powder and 1 oz. of shot; with such a load the recoil is even less than with a 16-bore of the same weight carrying a full 16-bore charge.

So great is the skill of the modern gunmaker that there need be no apprehension as to the killing pattern. This is a question of skilful boring and regulating, these light guns being constructed to give, with the ounce charge of shot at a distance of 40 yards, a pattern on a 30-inch circle in every way equal to that of the ordinary 12-bore game gun, 30-inch barrel, cylinder and modified choke, shooting the full charge of powder and $1\frac{1}{8}$ oz. of shot.

I give illustrations of one of these light 12-bores made by Messrs. Westley Richards (Figs. 205, 206 and 207). The dimensions and weight of this gun are as follow—

Length of barrels . . .	28 inches
Weight of barrels . . .	2 lb. 8 oz.
" " stock . . .	2 lb. $9\frac{3}{4}$ oz.
" " fore-end . . .	$7\frac{3}{4}$ oz.
Total weight .	5 lb. $9\frac{1}{2}$ oz.

This gun has been in regular use for eleven years, and is practically as sound and tight as on the day it first left the makers' hands.

Such guns are handy, comfortable and quick to align, and therefore it will readily be perceived that the 16-bore of practically the same weight cannot compare with them. Not only have such guns been built for sportsmen of slight figure, but they have answered admirably both for youths whose stature and build are above the average as well as for ladies' use, and these guns are doing good service. In the face of these facts there will be little difficulty in understanding that the 16-bore is not such a keen competitor of the 12-bore as it was in the black powder days. Those who still believe in the 16-bore must rather rest their arguments upon sentiment than upon the ground of solid facts.

FIG. 207.—UNDERSIDE OF GUN, LIGHT 12-BORE, FOR LADY.

Their recommendations of the 16-bore are shorn of all the facts and conditions which made them valid in the past.

Nevertheless, it may be considered that other points enter into the question than those of weight and recoil formerly mentioned. For instance, it may be urged that it is impossible, no matter how light, to make a 12-bore gun of such slim or slender proportions as a 16-bore; that the grasp of the stock and the fore-part of the gun must of necessity be thicker and bigger than they are in a 16-bore, and that in short the 16-bore is founded upon smaller and more delicate lines.

This is a practical and real objection which only holds good in certain cases; for although the light 12-bores alluded to are made small and easy to handle, and how small they seem in comparison with the 12-gauge of the past, nevertheless I am prepared to admit that in the case of some women the size of the stock and of the gun as a whole would constitute an objection to the ordinary 12-bore.

It is obvious that a woman's hand being so much smaller than a man's, could not comfortably grasp a 12-bore stock as a man's does. It has only to be looked at from the fact that while No. 7 would be a small hand for a man, No. $6\frac{1}{2}$ is by no means a small but a good comfortable-sized hand for a woman. Of course it is possible to make the grasp of a 12-bore stock much thinner on these light guns than on the average weight. Shooting as they do a reduced charge of powder and shot, these light guns do not need the same thickness or strength of wood as the ordinary 12-bore, and a greater degree of slenderness is furthermore made practicable by constructing the mechanism smaller and more compact.

Modern improvements have, in short, enabled the gunmaker to make all parts of his gun considerably lighter from end to end than was possible with a 7-lb. gun of the past, and still to maintain the same strength and durability. For those, therefore, who can handle a 12-bore made on these more intelligent lines, I consider a light gun, 12-bore, to weigh not over $5\frac{3}{4}$ lb., makes an ideal gun for the sportswoman.

I mentioned earlier that proper fitting had helped to render the sport of shooting popular with women. We recognize the importance of a correct fit to a sportsman, but it must be borne in mind that the knowledge of a sportsman's requirements and of what ranks as a correct fit have been derived from years of laborious and varied experience. It has not been possible to gain similar experience with regard to the essential points of fit for a woman, from the fact that ladies' orders for guns were actually "angels' visits."

It may therefore be supposed that there are few gunmakers who can speak with authority upon the proper construction and form of gun for a woman's use, but, nevertheless, there are some whose experience entitles them to do so. Fit, for woman's shooting, may well be considered of far more importance than in the case of the sportsman. It is the one point which may, if properly attended to, eliminate that natural feeling of nervousness engendered by the firing of the gun. If the gun fits, the gun does not "kick," nor would it bruise, whereas with these objections present confidence in oneself is considerably lessened. We all know that when shooting to flinch is fatal.

While upon this question of confidence in one's gun, it may be remarked that an argument in favour of a 12-bore is, that it forestalls a good deal of unpleasant criticism which is likely to arise. A miss with a small bore, although under the same conditions it might easily have been credited to a 12-bore, from mere contempt excites no surprise when shooting with men.

It is an undoubted fact that men using light 12-bores, as compared with those using heavier guns, render a very good account of themselves, and can shoot with the best. This being so, such weapons cannot be regarded with contempt, or made the subject of ridicule. When, however, a lady is shooting with a small bore, her gun is frequently regarded as a mere toy, and no doubt unintentionally, is made light of. By using a 12-bore, the superior attitude denoted, which is not conducive to an even temper, has no semblance of cause for existence.

But, reverting to the question of fit, sportswomen would do well to be careful in the selection of the maker, and be assured that he has had experience of building guns for women. Of course, all gunmakers will assert that they are capable of this work, and some of them have gone even further, and have advertised that they "build guns for old gentlemen and ladies," as if shooting were a common pastime of our grandmothers.

I give below a few particulars as to the guns that I know have performed satisfactorily when in the hands of women shooters—

First, the 12-bore, quarter pistol grip, delicately formed, or straight grip.	Maximum weight, $5\frac{3}{4}$ lb. Minimum " $5\frac{1}{2}$ lb. Length of barrels, 28 inches. Charge, 40 grs. of bulk nitro and 1 oz. No. 6 shot. Pattern: right, 140 pellets. " left, 190 pellets.

With the $5\frac{3}{4}$ lb. gun weight, 42 grs. and $1\frac{1}{16}$ oz. may be used. Should the recoil be found unpleasant, an anti-recoil rubber heel-plate will obviate it.

Second, the 16-bore, quarter pistol grip, delicately formed, or straight grip.	Maximum weight, $5\frac{1}{2}$ lb. Minimum ,, $5\frac{1}{4}$ lb. Length of barrels, 28 inches. Charge, 35 grs. bulk nitro and $\frac{15}{16}$ oz. No. 6 shot. Pattern: right, 130 pellets. ,, left, 180 pellets.

An alternative 16-bore is one weighing $5\frac{3}{4}$ lb. to shoot 38 grs. of powder and 1 oz. of shot. The extra charge gives a higher velocity. Recoil is not such as to cause inconvenience provided a gun of this weight is properly constructed.

Third, the 20-bore, quarter pistol grip, delicately formed, or straight grip.	Maximum weight, 5 lb. 6 oz. Minimum ,, 5 lb. 2 oz. Length of barrels, 28 inches. Charge, 32 grs. of bulk nitro and $\frac{5}{8}$ to $\frac{3}{4}$ oz. No. 6. Pattern: right, 120 pellets. ,, left, 150 pellets.

Lighter guns can be built by further shortening the barrels, but in the interests of the safety of fellow-sportsmen in the field, short barrels are generally to be condemned.

No general rule can be laid down as to the measurements of the stock of a woman's gun. There are certain fixed lines of construction which hold good, although they differ from those which govern the construction of the man's gun. But apart from this, a woman requires the length of stock, bend, and cast-off as accurately ascertained by actual trial as is the case with the sportsman, and these measurements will, of course, vary with the individual.

High-class modern guns are now made to handle so smoothly, and to work so easily, that gunmakers need no instruction upon this score. But those qualities, nevertheless, should especially distinguish the woman's gun. There should be no sharp corners or edges, the trigger-guard on either side should be rounded, the triggers of delicate construction, and having a smooth and round surface. The opening and closing of the breech should require no effort, and the ejection should be of faultless reliability.

The precise form assumed by that portion of the gun-stock which is grasped by the right hand in firing, known technically as the "hand" or "grip" is a matter, perhaps, best left to individual taste to decide. I have known women who have stated that the "pistol-hand" stock is an aid to holding the gun squarely to the eye and to the shoulder, particularly where small hands and thin stocks are concerned. Most men prefer the straight hand stock upon their 12-bore game guns. Guns of small calibre, 28-gauge and the like, are usually made with a slight pistol-hand, less than even the modified form known as the half pistol-hand, and which may be termed quarter pistol-hand.

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CHAPTER XVIII

LADIES IN THE FIELD

BY HER GRACE THE DUCHESS OF BEDFORD.

IF possible, I think women should begin their shooting career by shooting rabbits with a single-barrelled rifle. It is a safer weapon in the hands of a novice than a gun; there is only one barrel, and shots must be taken with more deliberation. The tendency of all beginners is to shoot too quickly, and though the rifle may make them a little too slow with the gun at first, it is a fault on the right side. The beginner also learns to appreciate the value of silence in the field, and by stalking her prey learns the real pleasure and excitement of sport, which will never be appreciated by the one who has begun at a pheasant *battue*. The rabbit shooting may, with advantage, be varied by wood-pigeon and rook shooting, if opportunity offers. For this purpose I have used a ·360 Express rifle with a small bullet, and the same rifle with a larger bullet can afterwards be used for deer-stalking. When proficient with the rifle I recommend a 16-bore gun. A 16-bore gives the average woman a better chance of holding her own with the 12-bore generally used by men. The charge I have found most suitable for a 16-bore is 35 grs. Amberite and 1 oz. No. 5½ shot. My own gun weighs about 5¾ lb., which is less than many 20-bores, the reduction in weight being obtained by having 28-inch barrels, and not by diminishing their thickness. Thus equipped, with sufficient practice, good sight, and a due regard for the laws of sport, there is nothing to prevent a woman more than holding her own with the majority of sportsmen using 12-bores.

In the matter of dress I draw a distinct line between the woman who shoots and the one who goes out to watch other people shooting and to attend shooting luncheons. The latter can wear any becoming walking costume which fashion and her tailor may dictate; but having learnt what is neatest and most appropriate for the sport the former should disregard fashion as completely as her fellow-sportsmen. Coat, skirt, cap, and gaiters should all be made of the same material, viz. a tweed, varying in thickness according to the season of the year. The colour should assimilate as nearly as possible with the natural surroundings of the wearer, *i. e.* heather mixtures of brown, grey and green. The materials should be well shrunk and water-proofed before being made up. And here let me add that it is quite unnecessary for the sportswoman to sacrifice her appearance at close quarters by wearing the startling checks and plaids affected by the deer-stalker, and said to render him inconspicuous on the hillside. The coat and skirt must be perfectly plain, and the latter without lining—and above all without the leather trimming or binding so dear to the heart of the tailor. Sleeves should be loose enough to allow of free play of the arms, and of wearing thick clothing underneath when required. There should be two pockets, large enough to hold from 15 to 20 cartridges, in the coat, and a larger one on the outside of the front of the skirt.

It is impossible for a woman to do a long day's walking in comfort, over the moors or in turnips, in a skirt which is longer than 8 inches below the knee. For those who can afford it, a second skirt reaching to within some 3 or 4 inches of the ankle, for use at covert-shooting parties, is less likely to excite comment amongst those who are more critical of shooting costume than of evening dress. Gaiters should reach to the knee, and be fastened to the band of the knickerbockers, and if the latter are made of the same material it adds to the neatness of the costume. As long as the cap matches the dress the shape is a matter for individual taste, but the yachting cap now used by motorists has, by general consent, proved the best for wind and rain. If the material is well shrunk before being made up it does not get out of shape, and the peak is a great protection from sun and rain. Boots should have light nails and perfectly straight, broad heels; the soles projecting slightly beyond the uppers, as in men's shooting boots.

Under the coat I recommend a flannel shirt, which can be worn

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with or without the coat; and if a small strap is worn round the waist, a woman can carry her own coat almost without noticing it.

Most people who have been out grouse driving in October, know what it is to get hot in a long tramp over rough ground, between the drives, and then to have to wait in a cold wind without additional clothing. The arrangement I have suggested enables a woman to walk in comfort, and to have an additional garment to put on for the wait. A woman who shoots should never allow her fellow-sportsmen to carry anything for her. Men are more or less bound to offer, but under these circumstances she should feel equally bound to refuse.

A woman should have a long probationary period of shooting by herself or with one other gun, before she joins large shooting parties, and if she has the true instinct of sport, I believe that a small mixed bag obtained by herself when carrying her own game and cartridges will always give her greater pleasure than her largest day's covert shooting, where she may kill her birds by hundreds.

The etiquette and laws of sport being much the same for sportswomen as for men, I will only touch upon two or three of the most important breaches of these laws to which women are said to be prone. Of these, dangerous and jealous shooting (neither the exclusive prerogative of sportswomen) are the worst. If a woman does not know when she has fired a risky shot, and repent it abjectly, I really do not know what I can say to make her. In cases where she is not hostess, her shooting invitations will probably diminish; where she is hostess, her guests will show a disinclination to return. Accidents are most likely to happen when walking up game; it should therefore be the rule to be perpetually on the look-out to see where the other guns and the beaters are, also that no outsider has walked within shot.

Jealous shooting is more easily warned against. Men with good manners are sometimes a little over-careful when shooting with women, and leave them birds which are in reality their own. Women should look out for this, and do as they would be done by. On the other hand there are men who, when their neighbour is a woman, will take every bird that they think is a long shot for her, "because she has only a 16- or 20-bore." This is trying; but a few birds killed at the same distance when the offending gun is otherwise engaged may have the desired effect. Many people shoot their birds too close, and, though not obviously mangled, render them unfit for table use. Some do it because they can only shoot birds coming to them; others, because they are afraid of the bird getting to their neighbour; but, whatever the cause, women should remember that they are not butchers but sportswomen. The woman who has learnt to shoot by walking up her game alone, will have a better idea of the distance at which her gun can kill than the one who begins at the covert-side. To her, also, I feel that the warning will be unnecessary against talking or walking before a drive or beat. But as all may not be able to learn in this way, it may be as well to remind the novice that, even though there is a long time to wait before beaters arrive, the ever-watchful bird, hidden in heather, grass, or brushwood, has noticed that the moving object in the distance is to be avoided when he rises. Where he goes, others who have not been on the look-out will follow, and the beat or drive will be spoilt.

Observance of the following rules will complete the education of the beginner, so far as it is possible to learn from a book, only practice will do the rest—

Always hold your gun, whether loaded or not, as if it *were* loaded, *i.e.* in such a position that, did it go off accidentally, it would injure no one.

Do not carry it across the bend of the left arm.

Never take it for granted that your gun is unloaded—look and see.

Always unload your gun when getting over a wall or fence.

Never fire a risky shot.

When shooting with others, stand where you are placed by your host, and do not move.

If told somewhat vaguely where to stand, be sure that you are in a line with the other guns, even if you are not at the distance from hedge or cover which suits you best.

Never follow ground or winged game across your neighbour, even if you do not mean to shoot till it has passed him.

A jealous shot is a nuisance to himself and an abomination to his neighbour.

Load your gun with barrels down, and close it by tipping the stock up, *not* the barrels.

Do not fire long shots at hares.

Avoid boasting that a bird was hit even though not killed. It is a matter for regret, not for boasting.

First aim at being a safe shot, and then a brilliant one, for to kill and not to wound should be the aim of every sportswoman.

Note that nearly every bird is missed by shooting below or behind.

THE DUCHESS OF BEDFORD'S RUCKSACK.

CHAPTER XIX

SHOOTING ABROAD

The necessary Armament—The Import Duties on Guns, Rifles, and Cartridges—The Sport to be obtained.

Arms suitable for killing Big Game.

ELEPHANT.—Modern High Velocity Express rifles of the following bores: ·400, ·450, ·500; whilst for absolute shock-giving properties Sir Samuel Baker's advice may be followed, viz. a ·577—which size has been much improved, and is an altogether more formidable weapon since that mighty elephant-hunter's day. The highest development of ·577 rifle shoots 100 grs. of cordite and 750 grs. bullet, and gives tremendous smashing power. As an alternative the ·600-bore, 100 grs. cordite and 900 grs. bullet may be used.

Rhinoceros.—The above rifles will answer for this pachyderm. If a small bore rifle is taken, as some sportsmen appear to prefer—I have heard of rhino being shot at close quarters with ·256-bores—this may well take the form of the new Accelerated Express ·375/·303, Axite powder and 215 grs. bullet, or the new ·318-bore.

Hippopotamus.—·360 to ·400 H. V. Express rifles; the new Accelerated Express above mentioned is a most suitable arm for this big game.

Buffalo.—A ·450 H. V. Express or even a ·577 H. V. Express, for this powerful and dangerous animal requires a heavy blow to render him incapable of harm.

Lion.—A ·360 to ·450 H. V. Express.

Tiger.—A ·450 with capped bullet. A 12-bore ball- and shot-gun, especially of the Explora type, with its highly expansive "all-lead" bullet, will prove a remarkably handy and deadly weapon for shooting tiger in thick jungle.

BEAR.—For big strong grizzly bear a ·400 H. V. Express. For black or brown bear a less powerful weapon will serve. The ·256 rifle has been used with success at black bear.

CHAMOIS.—Nothing less than ·375 H. V. Express with 40 grs. cordite and a "W. R." copper-capped bullet.

CROCODILE.—An Accelerated Express ·375/·303 or a ·318-bore. A 12-bore Explora will answer well.

ALLIGATOR.—An Accelerated Express ·375/·303. Also a 12-bore Explora.

DEER AND LARGE ANTELOPE.—May be shot with any Express rifle of small bore—·375/·303 Accelerated Express answers admirably. The new shot- and ball-gun, of ·558-bore, called the "Fauneta," of exceptional power and high velocity, and with two forms of bullet, (1) for expansion, and (2) for ranging power and penetration, will suffice for nearly every form of soft-skinned animal. It moreover is found an excellent all-round weapon where meat has to be shot for camp, shooting as it does bullet or small shot.

The ·256-bore H. V. rifle has been popular in various quarters for use in many phases of big-game shooting, but some experienced sportsmen declare it does not *stop* the game, the light bullet having excessive penetration and little shock-imparting power.

The following epitome of the various countries, the Game, big and little, to be found therein, the Import Duties on Guns, Rifles, and Cartridges has been very carefully compiled, the latest available information having been obtained, and should prove a handy guide for those sportsmen who contemplate going abroad in search of sport.

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
ALBANIA.		
	Arms prohibited, except by Turkish permit endorsed by British Ambassador at Constantinople. Duty, 8 per cent. *ad val.*	Woodcock appear on the coast about the first week in December, continuing until end of January. The large game consists of bear

Import duties on Guns, Rifles and Cartridges	*Shooting to be obtained*
	and chamois; wild pigs and roe deer may be found where there is good covert. The birds consist of woodcock, snipe, ducks, plover, teal, quail, etc. ·400 double rifle or ·375 will suit for both bear and chamois.

ANTIGUA.

Guns, £1 6*s.* 8*d.* each. Pistols, 13*s.* 4*d.* each. Other arms, 13⅓ per cent. *ad val.* Gunpowder, 8*d.* per lb. Cartridges and other ammunition, 15 per cent. *ad val.*	*See under* WEST INDIES.

ARGENTINE REPUBLIC (BUENOS AYRES).

Duty, 50 per cent. *ad val.* on guns and rifles.	The game consists of jaguar, puma, deer, guanaco, vicuna, hares, cavies, rheas, swans, geese, ducks, partridges, doves, snipe, and plover. Take strong light clothing. 28-bore Explora, 24-bores, 28-bores, and 32-bores. Climate varies considerably.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

ASIA MINOR.

See TURKEY AND ALBANIA.	The game of Southern Asia Minor consists of wild boar, fallow deer, gazelles, wolves, hyænas, leopards, and hares, and on the mountains red deer, ibex, and lynx. The birds are partridges, francolin, quail, and black-cock. A 12-bore ball- and shot-gun would fill the bill pretty well here. For red deer, ibex, and leopard a ·375/·303 might be taken. Climate unhealthy in autumn, it improves in November.

AUSTRALIAN COMMONWEALTH.

Military match and cadet rifles free. Sporting rifles and shot-guns, 10 per cent. *ad val.* Revolvers, pistols, air-guns and pistols, 15 per cent. *ad val.* Cartridges free. A duty of 5*s.* per cwt. on shot, bullets, and slugs. Sporting powder free. The duty is now under revision, and may shortly be somewhat increased.	Kangaroos, opossums, wombats, bandicoots, and echidna. Birds are numerous: running emus, cassowaries, king-fishers, black swans, lyre birds, bower birds, doves, ducks, geese, and sea-birds, bronze-wing pigeons, topnot pigeons, wonga pigeons, quail, bustard.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

AUSTRIA-HUNGARY.

Guns and rifles, £2 5*s.* 9*d.* per cwt. Gunpowder and cartridges can only be imported by special permission. Gunpowder, £2 13*s.* 4*d.* per cwt. Cartridges, £2 13*s.* 4*d.* per cwt. Caps, £1 4*s.* 5*d.* per cwt.	Fur and large game: Wild boar, deer, wild goat, bear, wolf, lynx, fox, wild cat, jackal, otter, beaver, pole-cat, marten, weasel, hare. In Chapter XV is given the official bag of Austrian game for 1905. Feather: Eagle, hawk, and 248 species of smaller birds. Mean temperature: 59° F. in south, 48° F. in north.

BAHAMAS, W.I.I.

20 per cent. *ad val.* Gunpowder, 3*d.* per lb. Other ammunition, 20 per cent. *ad val.*	*See under* WEST INDIES.

BANGKOK (SIAM).

3 per cent. *ad val.* for guns, rifles, and revolvers.	Elephant, rhinoceros, tapir. Climate tropical, but fairly healthy. April hottest month.

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
BARBADOES.	All firearms 10*s.* each, and 20 per cent. on total of duty leviable. Gunpowder free. All other ammunition 10 per cent. *ad val.*, and 20 per cent. on the amount of duty.	Hardly any shooting except for a month or so during the wet season.
BASUTOLAND.		*See* SOUTH AFRICA.
BECHUANALAND.		Game, rhinoceros, buffalo, zebra, quagga, rhebuck, duiker, klipspringer, steinbuck, elephant, giraffe, eland. The shooting of the above is regulated by the Large Game Preservation Proclamation (excepting rhebuck, klipspringer, duiker, and steinbuck). The close season is from Oct. 1st to Feb. 28th. The issue of licences is at the discretion of the Resident Commissioner.
BELGIUM.	Absolutely free. Shot, 10 per cent. *ad val.* Gunpowder, 6*s.* 1*d.* per cwt.	There is very little game shooting to be obtained; it is let in every direction, and is by no means easy to get, it

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	being the custom of the local proprietors to keep the shooting to themselves.
BERMUDA.	
Military and naval arms free. All other arms, 50 per cent. *ad val.*	
BORNEO.	
	Fur and large game: Tiger, leopard, elephant, civet, tapir, mungoose, monkey tribe, wild cattle. Feather: Trogon, shrike, rainbird, pheasant, barbet, woodpeckers, etc. Mean annual temperature: 90° F.
BRAZIL.	
Single-barrel guns and rifles, each 5000 reis and 50 per cent. *ad val.* Double-barrel guns and rifles, each 1000 reis and 50 per cent. *ad val.*	Fur and large game: Jaguar, puma, peccary, tapir, capybara, marmoset, sloth, Brazilian dog, lobo (wolf), raccoon, opossum, paca, armadillo, four species of deer tribe. Feathered: 1700 species of Brazilian birds, bat, vampire, toucan tribe, falcon, owl, vulture, etc. Mean temperature: 63° F. (Rio Janeiro) to 85° F. (Cerara).

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

BRITISH COLUMBIA.

See CANADA.

Plenty of shooting and fishing. Best time for camping out, June to October. $50 licence must be obtained. Bears, wolves, panthers, deer, wapiti, caribou, moose, mountain sheep, goats, grouse, partridges, quail, pheasants, ducks, geese, and plover.

BRITISH EAST AFRICA.

Via Mombasa, the present duty is £2 per weapon, whether guns or rifles, single or double-barrel, and when the £2 is paid, the Customs' House marks every weapon on the stock. Ammunition is charged for duty at 10 per cent. *ad val.*

A non-resident sportsman's licence cost £50. With this *two* specimens of each of the following species of game may be killed or captured:—Elephant (males only), rhinoceros, hippopotamus, zebra (other than mountain zebra), antelopes and gazelles. Class A—oryx (gemsbok, colotis, or beisa), hippotragus (sable or roan), strepsiceros (kudu), aard-varks (orycteropus), serval, cheetah, aard-wolf, colobi and other fur monkeys, smaller monkeys, ostrich (male only), marabous, egret. Of the following

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	species *ten* of each may be killed :—Antelopes and gazelles. Class B—any species than those in Class A. Chevrotains (dorcatherium), wild pig of each species, the smaller cats, jackal. There is no restriction as to the number of lions, leopards, crocodiles, etc. which may be killed, and for the shooting of these animals no licence is required. A settler's licence costing but £10 permits the killing of a restricted bag of certain game animals. There, however, appears to be no restrictions as to the number of licences that are issued, and this fact may counteract the good intended by the regulations limiting the bag. I am informed by some sportsmen that under the present conditions they think that five years will "see the thing out," unless licences also are limited by the administration. Maximum temperature 98°, minimum 60°.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
BRITISH GUIANA.	
Muzzle-loading guns, 4*s.* 2*d.* each. Revolvers and pistols, £1 0*s.* 10*d.* each. All other arms, 15 per cent. *ad val.* Cartridges, 6*s.* 3*d.* per 100. Cases, 2*s.* 1*d.* per 100. Caps, 2*d.* per 100. Shot, 1*d.* per lb. Gunpowder and fuses, ½*d.* per lb. Other explosives, 10*d.* per lb.	Game consists of tapirs, jaguars, pumas, deer, bush-hog, ant-bear, wild ducks, turkeys, birds locally known as pheasants and partridges. Climate warm but not oppressive. Take tropical outfit.
BRITISH HONDURAS.	
Rifles, 7*s.* 2½*d.* each. Revolvers and pistols, 12*s.* 4*d.* each. All other arms, 10 per cent. *ad val.* Gunpowder, 2½*d.* per lb. Blasting gunpowder, ½*d.* per lb. Other explosives, 10 per cent. *ad val.*	Fur and big game: Jaguar, puma, ocelot, alligator, lizard, etc. Feather: Vulture, toucan, hawk, turkey, buzzard. Aquatic birds numerous. Mean annual temperature: 60° F. to 70° F.
BRITISH INDIA.	*See* INDIA.
BRITISH NEW GUINEA.	
10 per cent. *ad val.* Cartridges or cartridge-cases, 10 per cent. *ad val.* Gunpowder and dynamite, 3*d.* per lb. Shot and bullets, 2*s.* 4*d.* per cwt. Fuses, 10 per cent. *ad val.*	

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
BUENOS AYRES.	
50 per cent. *ad val.*	Game at reasonable distance by rail, consists of deer, partridges, doves, snipe, and ducks.
BULGARIA.	
Military weapons prohibited. Sporting guns and rifles, 14 per cent. *ad val.* Gunpowder, £2 5*s.* 7*d.* per cwt. Cartridges, £2 16*s.* 11*d.* per cwt.	Fur and big game: Bear (secluded districts of the Balkans), red and roe deer, chamois, wild boar, wolves (numerous), hares. Feather: Eagle, bustard, pheasant, snipe, wildfowl, partridge, woodcock, quail, hoopoe, etc. Mean annual temperature: Balkans, 37° F.; Sofia, 30° F. NOTE.—In the districts extending from the Balkans to the Danube, the winter cold is intense.
BURMA.	*See* INDIA.
CAIRO.	*See* EGYPT.
CALIFORNIA.	
	Deer, elk, antelope, sheep, fawn are protected. Quail, partridges, grouse, and rails from October 1 to March 1. Climate salubrious and enjoyable.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained.*
CANADA.	
Arms for army use free. Guns, rifles, air-guns, pistols, revolvers, and other firearms, 30 per cent. *ad val.* British preferential tariff is subject to reduction of one-third. Arms from Germany are subject to additional sur-tax of one-third. Gunpowders, 1·48*d.* per lb. Cartridges, cases, etc., 30 per cent. *ad val.* British preferential tariff applies.	Fur and large game: Moose (forests of the Mackenzie Valley and northern part of British Columbia, Nova Scotia and New Brunswick), badger, caribou (forests of the Dominion), Virginia deer, puma, cougar or mountain lion, wild cat, Canada lynx, grey wolf, fox, wolverine (wooded regions of the North-West), weasel, mink, skunk, otter, raccoon (Eastern and Pacific provinces), bear, black and grizzly (central part of British Columbia and the Rockies), polar bear (shores of the Arctic), antelope, American elk (wapiti), coyote, bison (practically extinct), mountain goat, musk ox, seal (Arctic coast), marten, pine marten, pekan. Feather: Golden eagle, hawk, owl, partridge, grouse, ptarmigan, osprey, the fisher, etc. The sea-birds include a great variety of wild geese, ducks, and other wild-

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	fowl, gulls, cormorants, fulmars, petrels, etc. Mean temperature: Ontario, 19° F. (winter), 69° F. (summer); British Columbia, 22° F. (winter), 72° F. (summer); Montreal, 16° F. (winter), 72° F. (summer).
CANARY ISLANDS.	Shooting very poor, what there is consists of rabbits and partridges.
CAPE COLONY.	*See* SOUTH AFRICA.
CELEBES.	Fur and large game: Baboon or ape, deer, buffalo, wild pig, babirusa or "horned pig," lemur, civet cat, squirrel, etc. Feather: 160 species of land birds much the same as neighbouring islands. Mean annual temperature: 89° F.
CEYLON. Guns, rifles, and carbines, single-barrel, 5 rupees each; double-barrel, revolving or magazine, 10 rupees each. Pistols, revolvers or	Elephant, buffalo, elk, deer, wild pig, leopards, small black bear, junglefowl, partridges, peacocks, ducks, and snipe. A licence is required.

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	magazine, 4 rupees 50 cents. Single pistols, 2 rupees 25 cents. All other arms, 5 per cent. *ad val.* Arms and ammunition can only be imported by way of merchandise by authority of the Governor. Gunpowder, 25 cents per lb. Cartridges and caps, 20 per cent. *ad val.*	Ball- and shot-gun specially recommended.
CHINA.	5 per cent. *ad val.* on firearms. 5 per cent. *ad val.* on ammunition.	Not much big game, there are, however, tigers, leopards, and panthers, and fair amount of small deer and wild pigs. Small game good, comprises swans, geese, ducks, teal, snipe, quail, pheasant, partridges, woodcock, and hares.
COLOMBO.		*See* CEYLON.
CORSICA.	Importation of cartridges prohibited, but French ones can be obtained at Ajaccio.	Shooting rather poor, consists of moufflon, hares, quail, woodcock, duck, snipe, partridges, and an occasional wild boar. Permit required, costs 25 francs. 12-bore Explora, $6\frac{1}{2}$ to $6\frac{3}{4}$ lb. weigh. Mean winter temperature about 55° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
CYPRUS.	
Guns and rifles over £4 value, 25 per cent. *ad val.*	Game is scarce, but consists of moufflon, partridges, francolins, bustard, quail, woodcock, snipe, and duck. At Nicosia mean temperature 109° F. in shade in summer.
DENMARK.	
Guns and rifles, £1 17*s.* 8*d.* per cwt. Shot, 2*s.* 4½*d.* per cwt. Gunpowder and caps, 9*s.* 5*d.* per cwt.	Shooting season: Partridges, September to December, snipe begins on August 1; in November the driving of hares and deer takes place, but this is entirely on the estates of the nobility. Wildfowl shooting fairly good. The river fishing is very poor.
DOMINICA, W.I.I.	
Guns, rifles, and pistols, 25 per cent. *ad val.* Cartridges, cases, and caps, 20 per cent. *ad val.* Gunpowder and explosives, 6*d.* per lb.	*See under* WEST INDIES.
DOMINION OF CANADA.	*See* CANADA.
EAST AFRICA.	
Guns, rifles, and pistols, 10 per cent. *ad val.*	

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

EAST AFRICA (German).

Fur and large game: Buffalo, gazelle, giraffe, hartebeeste, lion, colobus guereza, elephant, mungoose, crocodile, hippopotamus, rhinoceros, genet.

Feather: Ostrich, duck, Egyptian goose, stork, spur-winged plover, francolin, pelican, and numerous water-fowl, sand-grouse, etc.

Tsetse-fly infests portions of the country.

Mean annual temperature: 80° F.

EAST AFRICA (Portuguese Territory).

Fur and big game: Ostrich, giraffe, crocodile, hippopotamus, springbok, antelope, gnu, eland, buffalo, zebra, etc.

Feather: Guinea-fowl, pheasant, goose, plover, pelican, etc.

Tsetse-fly infests district.

Mean annual temperature: 60° F.

Zambesia, temperature max. 107° F., min. 63° F. —33° F. has been recorded.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
EAST INDIES (NETHERLANDS).	
10 per cent. *ad val.*	*See* BORNEO, CELEBES, JAVA, SUMATRA, SEYCHELLES.
EGYPT (CAIRO).	
8½ per cent. *ad val.*	Climate trying in summer months. Quail shooting near Cairo in February and March. Sand-grouse and red-leg partridge on edge of the desert.
FALKLAND ISLANDS.	
Free. Gunpowder and cartridges, free.	Country very rough, much of the surface is of peat, good shooting which consists of geese, snipe, ducks, rabbits; also wild cattle, which are said to be dangerous now and again. The climate is bleak but healthy. Best time to visit, December to March.
FIJI.	
Guns, rifles, and pistols, 20 per cent. *ad val.* Shot and bullets, 5*s.* per cwt. Cartridges, 2*s.* per 100. Cases, 1*s.* per cwt. Caps, 1*d.* per 100. Gunpowder, 6*d.* per lb. Cartridges, etc., 12½ per cent. *ad val.*	No mammalia excepting dog, pig, and domestic fowl (introduced). Feather: 41 species of land birds. Few birds of prey, parrot and pigeon tribe well represented. Fifteen aquatic species. Mean annual temperature: 80° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

FLORIDA.

See UNITED STATES.

Fur and big game: Black bear, cougar, panther, wild cat, wolf, fox, raccoon, opossum, fish-otters, alligator, deer, and much smaller game.

Feather: Duck, wild turkey, hawk, eagle, vulture, owls, and a vast variety of smaller birds.

Mean annual temperature: 60° F.

FRANCE.

Muzzle-loading sporting guns, £4 17*s.* 7*d.* per cwt. Breechloading pinfire sporting guns, £7 2*s.* 3*d.* per cwt. Hammer central-fire sporting guns, £16 5*s.* 3*d.* per cwt. Hammerless sporting guns, £20 6*s.* 6*d.* per cwt. Rifles, £10 3*s.* 3*d.* per cwt. All gunpowder, military caps and cartridges, and cartridges for rifle clubs, prohibited. Sporting caps, £1 10*s.* 6*d.* per cwt. Cases, £1 10*s.* 6*d.* per cwt.

Fur and big game: Bear (very rare but still found in Alps and Pyrenees), wolf (Cevennes and Vosges), fox, marten, wild boar, stag, hare, rabbit, wild cat, genet.

Feather: Eagle, kite, partridge, wild fowl of many different kinds, lark, etc.

Mean annual temperature: 50° F. (Paris); 51° F. (Breton); 53° F. (Girondin); 51° F. (Auvergne); 57° F. (Mediterranean).

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
GAMBIA.	
Breechloading guns and rifles, 20*s.* each. Other arms, 5 per cent. *ad val.* Gunpowder, 1*d.* per lb. All other explosives, 5 per cent. *ad val.*	*See under* AFRICA, WEST.
GERMANY.	
Sporting guns and rifles, £1 10*s.* 6*d.* per cwt. Shot, 3*s.* $0\frac{1}{2}$*d.* per cwt. Gunpowder, free.	Fur and large game: Fox, marten, weasel, badger, and otter (found everywhere), wolf (rare), roe, stag, boar, hare, fallow deer, wild rabbit, elk (forests of Northern Prussia). Feather: Wild geese, duck, grouse, partridge, snipe, woodcock, quail, widgeon, teal, etc. Mean annual temperature: South-west Germany, 52° F. to 54° F.; Central Germany, 48° F. to 50° F.; West and East Prussia, 42° F. to 44° F.
GIBRALTAR.	
Guns, rifles, and pistols, free. Ammunition and explosives, free.	No shooting in vicinity, but at Casa, Vigea, and Tapinalla (about 40 miles distant) there is excellent wildfowl, geese, snipe, quail, and bustard.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
GOLD COAST.	
Guns and rifles, 2*s.* 6*d.* each; if for use of Governor or H.M.'s troops, free. West of Volta, gunpowder, 6*d.* per lb. Cartridges, 5*s.* per 100. Cases, 1*s.* per cwt. Other ammunition, 10 per cent. *ad val.* East of Volta, gunpowder, 6*d.* per lb. Other explosives, 4 per cent. *ad val.*	*See under* AFRICA, WEST.
GREECE.	
Guns and rifles, single-barrel muzzle-loaders, 1*s.* $7\frac{1}{2}$*d.* each; double-barrel muzzle-loaders, 9*s.* $7\frac{1}{4}$*d.* each. Single-barrel breechloaders, 8*s.* each. Double-barrel breech-loaders, 16*s.* each. Cartridge-cases, 6*s.* 5*d.* per 1000. Cartridge-cases loaded, 24*s.* per 1000. Caps, £12 16*s.* per cwt. Gunpowder for firearms, £2 17*s.* 7*d.* per cwt. Gunpowder for blasting, 6*s.* 5*d.* per cwt.	Fur and large game: Wolf, bear (rare), lynx, wild cat, boar, stag, roe-buck, fox, marten, jackal, badger, hare, etc. Feather: Snipe, wild duck, eagle, vulture, owl, egret, pheasant, hawk, bustard, partridge, wood-cock, and smaller birds. Mean annual temperature, 64° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
GRENADA.	
Guns, rifles, and pistols, $7\frac{1}{2}$ per cent. *ad val.* Gunpowder, 6*d.* per lb. Other ammunition and explosives, $7\frac{1}{2}$ per cent. *ad val.*	*See under* West Indies.
GUATEMALA.	
Breechloading and repeating firearms, $2 per kilo gross. Breechloading arms of calibres 0·33, 0·44, 0·50, and 0·58, carbines and rifles used by the army, also Remington, Winchester, and Evans' arms, absolutely prohibited.	Climate generally healthy. Soil remarkably fertile. Living is dear. The game is scarce, it includes jaguar, puma, ocelot, deer, tapir, and peccary. The birds are wild turkeys, pigeons and doves.
HALIFAX (Nova Scotia).	
	Hunting, shooting, and fishing abound in this province. Bears, foxes, moose deer, otter, mink, sable, musquash, hares, raccoons, squirrels, woodcock, plover, snipe, partridges, geese, ducks, curlew.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
HOLLAND.	
Guns, rifles, and pistols, 5 per cent. *ad val.* Shot, free. Gunpowder, 4*s.* 3*d.* per cwt.	Good wildfowl shooting. Licence costs about £2 for ordinary gun and £6 for punt gun, without which and a good punt gun the shooter stands about as much chance of obtaining wildfowl as he would in Bond Street.
HONG KONG.	
Guns, rifles, and revolvers, free. Ammunition, free.	Fur and large game: Tiger, panther, buffalo, wild swine, monkey, antelope, yak, gazelle, wild goat, wild ass, fox. Feather: Pheasant, cuckoo, lark, etc. Mean annual temperature: 83° F. to 90° F. (summer), 40° F. to 75° F. (winter).
HUNGARY, AUSTRIA-.	
Guns and rifles, £2 5*s.* 9*d.* per cwt. for all portable firearms. Gunpowder and cartridges can only be imported by special permission. Gunpowder, £2 13*s.* 4*d.* per cwt. Cartridges, £2 13*s* 4*d.* Percussion caps, £1 4*s.* 5*d.* per cwt.	

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
ICELAND.	
Free.	Game birds of Iceland are : Swan, geese, ducks, teal, curlew, golden plover, snipe, and ryper. Temperature varies in summer from 75° F. on a calm day in the sun to a hard frost.
INDIA, BRITISH.	
Subject to the Indian Arms Act and orders made thereunder. If forming part of the regular equipment of an officer, or for use of military forces of native state organized for Imperial service, free. Revolver or pair of pistols accompanying an officer, imported by an officer for his equipment, or revolvers imported for police use, free. Firearms other than pistols, 50 rupees each. Pistols, 15 rupees each. Provided that no duty in excess of 10 per cent. *aa val.* shall be levied on arms lawfully imported for private use. Provided also that an importer, having paid,	The best season for general sport would be October to end of February. Fur and game : Tiger, leopard or panther, cheetah, bear, wild boar, wolf, civet, rhinoceros, bison (gaur), nilgai or blue bull, gayal, elephant, deer :—Barking, brow-antlered, hog, Cashmere musk, sambhur, cheetul or spotted deer, swamp or barasinga ; mungoose, antelope, markhor, ibex, wild dog, wild ass, buffalo, crocodile, wolf, etc. Feather : Parrot tribe, vulture, eagle, falcon, kingfisher, water-fowl (numerous), floriken, snipe, pigeon, partridge,

Import duties on Guns, Rifles, and Cartridges.	*Shooting to be obtained*
or being liable for full duty, and having afterwards sold the arm or arms by retail to a person lawfully entitled to possess such arms, may apply for a refund of duty in excess of 10 per cent. *ad val.*, or for a remission if the duty has not previously been paid. Shot, 5 per cent. on a tariff valuation of 15 rupees per cwt. *ad val.* All other explosives and fuses, 5 per cent. *ad val.* Gunpowder of all sorts, 10 per cent. *ad val.*	sand-grouse, quail, plover, duck, teal, sheldrake, wigeon, jungle-fowl, peacock, etc. Mean annual temperature: Madras, 82° F.; Calcutta, 79° F.; Simla, 54° F.; Bombay, 78° F. A detailed account of Indian game is given in that handy guide to sportsmen, the "Shikar Book," compiled by W. S. Burke, editor of *The Indian Field.*

INDIA, BRITISH (RANGOON, BURMA).

	A shot-gun answers every purpose near Rangoon, for snipe, fowl, and the few ducks on river. The jungle is very dense and rather unhealthy. The big game in Burma varies very much. The ·577 heavy power has proved very successful. All clothing should be of light material and quite loose.

ITALY.

£32 per cwt. net. Gunpowder, £4 1*s.* 4*d.*	Fur and large game: Wild boar, moufflon,

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	per cwt. Percussion caps, £4 9*s.* 5*d.* per cwt. Cartridges, £4 1*s.* 4*d.* per cwt. Capped cases, £1 10*s.* 6*d.* per cwt.	hare, lynx, buffalo, wolf, marmot. Feather: Pheasant, partridge, quail, vulture, ibis, flamingo, pelican. Mean annual temperature (for whole country): 46° F. and 62° F. Highest temperature recorded: 109° F. (in Apulia); lowest, 25° F. (Monte Stelvio).
JAMAICA.	Guns, rifles, and pistols, $16\frac{2}{3}$ per cent. *ad val.* Cartridges, per 100 1*s.* 6*d.* Shot, 8*s.* per 100 lb. Gunpowder and other explosives, 1*s.* per lb. Caps, detonators, and fuses, $16\frac{2}{3}$ per cent. *ad val.*	Wear clothes the same as for England in summer. Climate not unhealthy. Shooting includes guinea-fowl, quail, partridges, pigeons, ducks, teal, plover, and snipe.
JAPAN.	Guns, rifles, and pistols, 25 per cent. *ad val.* Bullets and shot, 3*s.* $9\frac{1}{2}$*d.* per cwt. Smokeless powder, 15 per cent. *ad val.* Other gunpowder, 8*s.* $6\frac{1}{2}$*d.* per cwt.	Large game in North Japan, but difficult to get. Wild pig, pheasant, quail, geese, duck, woodcock in plenty. Licence costs about £3, and is difficult to get. Season opens October 15. Small deer, bear, and willow grouse also to be had.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
JAVA (NETHERLANDS). Guns, rifles, and pistols, 10 per cent. *ad val.*	Best time to go would be August. Tigers said to be abundant. Wild boar, sambur, panthers, rhino, wild cattle, crocodiles, wild dogs and cats ; peacocks, jungle-fowl, a variety of pigeons and hornbills. Climate fairly healthy.
KHARTUM.	The nearest point at which to obtain sport of any account is in the direction of Fashoda, up the White Nile. There the big game would include lions, leopards, cheetahs, buffaloes, elephants, giraffes, antelopes, etc. Of fowl there are bustards, ostriches, guinea fowl, geese, ducks, francolin, etc. The unhealthiness of the climate, the heat and the mosquitoes, render shooting practically impossible for the European, save in February, March and April. Non-residents' licence fee to hunt in the Sudan

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	was fixed at £40, in December 1903. But this may have since been altered. There are plenty of fish, some of very large size; there are also fish something like tench, and others like big dace; the baits used are spoons, dhura paste, meal, etc. The outfit is of course a tropical one, and as regards guns, rifles, and ammunition, a permit must be obtained from the Minister of the Interior at Cairo. An application should be accompanied with the original invoice. A Berthon boat would be found very useful. Temperature: max. 116·6° F., min. 71·6° F.

LABUAN.

All arms, free. Ammunition, free.	Game, as Borneo. Mean annual temperature: 90° F.

LAGOS.

For H.M.'s troops, free. All other firearms, 2*s*. 6*a*. each.	*See under* Africa, West.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
MADEIRA.	
Single-barrel rifles, 1500 reis each. Double-barrel rifles and guns, 2500 reis each.	Shooting not good, a few red-legged partridge, pigeons numerous. Quail, woodcock, and rabbits in fair numbers. Good sea fishing.
MALAY PENINSULA.	
	Fur and large game: Tapir, hog, small bear, sunda ox, bison, tiger, leopard, mungoose, chimpanzee, orang-outang, civet. Feathered: Hornbill, Javanese stork, pheasant, wild geese, wild duck, snipe, bird of paradise, myna or grackle, dial bird, humming-bird, kingfisher, doves, and pigeons in endless variety. Mean temperature: 90° F.
MALTA.	
Free. Cartridges, etc., free.	Scanty fauna, for the most part European. Twelve indigenous species of birds. Great numbers of migratory birds rest here. Mean temperature 80° F. (winter), 90° F. (summer).

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
MAURITIUS.	Guns, rifles, and pistols, 20 per cent. *ad val.*, and 4 per cent. on the total of duty levied. Caps, 20 cents per 1000. Cartridges, 25 cents per 100. Cases, 20 cents per 100. Sporting gunpowder, 3 rupees and 0·5 cents per cwt. Shot, 1 rupee 52 cents per cwt. Other ammunition, 10 per cent. *ad val.*, subject to further 4 per cent.	Climate not healthy, outfit same as for India. Good sea fishing. Shooting consists of deer, wild pig, wild duck, and is strictly preserved.
MEXICO.	Pesita, 1·75 per kilo. Legal: the kilo equals 2·204 lb., peso equals 4*s.* 2*d.*	Wet season May to October. Climate delightful during dry season. Take light woollen clothing and shooting-boots. A few bear and deer, and in the plains, quail, snipe, rabbits, and hares. In the lagoons and rivers, geese and duck. Good fishing in the mountain streams.
MOLUCCAS.		Fur and large game: Ape, wild pig, civet cat, babirussa, lemur. Feather: Parrot tribe,

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	pigeon, kingfisher, crimson lories, paradise bird (78 species). Mean annual temperature: 88° F.

MONTSERRAT, W.I.I.

Guns, 20*s.* each. Rifles, 10 per cent. *ad val.* Pistols, 10*s.* each. In addition, $33\frac{1}{3}$ per cent. on the amount of duty charged. Gunpowder, 6*d.* per lb. Cartridges, 10 per cent. *ad val.*, with additional duty of $33\frac{1}{3}$ per cent. on amount leviable.	*See under* WEST INDIES.

MOROCCO.

Sporting guns and cartridges are now passed into Morocco, but rifles and ball cartridges are not allowed.	From August 1 to February 28, partridge, bustard, sand grouse, rock and wood pigeons, plover, hare, gazelle, wild boar, fox, and jackal are plentiful. From December to March, snipe, woodcock, duck, and ruddy geese. In February and March quail are numerous, and on the nearer spurs of the

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
	Atlas Mountains moufflon may be shot. Quarters at Palm Tree Hotel, near Mogador, Southern Morocco.

NATAL. *See* SOUTH AFRICA.

NEWFOUNDLAND.

Guns and rifles, of all kinds, 30 per cent. *ad val.* Settlers and tourists have special privileges under special conditions.	Caribou or deer, open September closes February; licence expensive. Snipe, curlew, plover, August 20 to January 12; grouse, ptarmigan, partridge, rabbits, and hares from September 15 to January. Otter and beaver from October 1 to April 1.

NEW GUINEA.

	Fur and large game: Kangaroo, wild pig, anteaters. Feather: 400 species of land birds, bird of paradise, kingfisher, parrot tribe, cockatoo, pigeon, etc. Mean annual temperature: 83° F.

	Import duties on Guns, Rifles, and Cartridges.	*Shooting to be obtained*
NEW ZEALAND.	All firearms of British manufacture, 20 per cent. *ad val.* On all arms the produce of other than British Dominions, an additional duty of 50 per cent. is leviable. Shot cartridges 10- to 24-bore, 1*s.* 6*d.* per 100, all other cartridges, 20 per cent. *ad val.* Cases, 9*d.* per 100. Sporting gunpowder, 6*d.* per lb. Other gunpowder, free.	Shooting includes: Deer, pigs, hares, rabbits, pheasants, quail, duck, and black swan. Just as this book is going to press a paragraph has appeared in an American journal alleging that shooting in New Zealand has been prohibited for one year—no dates being given. I have interrogated the High Commissioner for New Zealand on this point, who replies that he has received no intimation of the sort from the Government of New Zealand. Sportsmen, however, who propose visiting this country for sport, should make careful inquiry beforehand, as from the latest information to hand, we gather that the sporting rights over some of the best deer forests in the islands have been exclusively reserved by the proprietors.
NORTH AFRICA.		Fur and large game: Lion, panther, bear, wild boar, jackal, leopard,

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
		hyæna (very numerous), antelope, genet, mungoose, gazelle, wild sheep. Feather: Eagle, falcon, vulture, thrush, swallow, pigeon, partridge, quail, heron, pelican, swan, duck, grebe, etc. Mean annual temperature: 64° F. (Northern slopes); Algeria, 50° F. (winter) to 75° F. (summer).
NORWAY.	Guns and rifles, £2 16*s.* 6*d.* per cwt. Shot, 4*s.* $6\frac{1}{4}$*d.* per cwt. Gunpowder and cartridges, 5*s.* $7\frac{3}{4}$*d.* per cwt. Caps (percussion), free.	Elk shooting prohibited. The birds are: Ptarmigan, grouse, plover, and duck. Reindeer shooting commences August 1 and closes March 31. Partridge, capercailzie, etc.
NOVA SCOTIA.		Licence required to shoot cost about £10. Seal and duck shooting very good. Best time, November to April. Good men can be hired from $1 per day. Caribou, grouse, partridges, woodcock, snipe, teal.
ORANGE RIVER COLONY.		*See* South Africa.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
PERSIA. Arms prohibited except by special permit to be obtained from the Government at Teheran. Duty payable, £3 16*s.* each.	Fur and large game: Lion, tiger, leopard, cheetah, hyæna, wolf, lynx, buffalo, mungoose, goat, jackal, gazelle, and caracal. Smaller beasts of prey. Feather: Bustard, pheasant, partridge. Climate varies much according to locality. In the south it is tropical; in the north, while the summers are hot the winters are as severe as those of Canada or Russia. Summer temperature: Ispahan, 87° F.; Teheran, 80° F. The custom is to shoot on horseback, ride up the game and fire at close quarters. The chief object is to kill, and the question of killing in a sportsmanlike way, as we understand sport in England, does not concern the Persian shooter. Explora 12-bore guns are used by H.I.M. the Shah, and these weapons, as also the new ·558 high-velocity ball- and shot-gun, are especially suitable for Persian sport.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
PERU.	
Single-barrel hammer guns and rifles, 4*s*. each. Double-barrel hammer guns and rifles, 8*s*. each. Single-barrel hammerless, 20*s*. each. Double-barrel hammerless, 28*s*. each. Small rifles for gallery practice, 8*s*. each.	Tapir, pumas, occasional bear, huanacu, vicunas, and deer; geese, ducks, wildfowl, plover, and partridges. Fishing very good.
PHILIPPINE ISLANDS.	
On all arms, 1 peso per kilo. Peso = 4*s*. 2*d*.	Fur and large game: Ape, wild cat, wild pig, squirrel, lemur, deer, civet, monkey tribe, crocodile. Feather: Parrots, pigeon, woodpecker, quail, etc. Mean annual temperature, 81° F.
PORTUGAL.	
Breechloaders, single-barrel, 13*s*. 6*d*. each. Double-barrel, £1 2*s*. 6*d*. each. Gunpowder, £3 1*s*. 9*d*. per cwt. Cartridges, £5 14*s*. 4*d*. per cwt. gross.	Fur and large game: Wolf, roe deer, Portuguese lynx, ibex, etc. Feather: Golden eagle, woodcock, snipe, bustard, partridge, quail, etc. Mean annual temperature: 61° F., Lisbon.

	Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
QUEENSLAND.	Guns, rifles, and pistols, 10 per cent. *ad val.* Shot, 5*s.* per cwt. Powder, free.	Kangaroo, native bear, opossums, black swans, ducks, plover, snipe, bustard, quail, and pigeons.
RANGOON.		*See* INDIA.
RHODESIA.		*See* SOUTH AFRICA.
ROUMANIA.	Military weapons prohibited. Sporting patterns, £3 5*s.* per cwt. Gunpowder and loaded cartridges prohibited. Shot, 1*s.* 7½*d.* per cwt.	Fur and large game: Wild boar, wild goat, wolf, hare, marten, wild cat, etc. Feather: Eagle, hawk, snipe, wildfowl, hoopoe, etc. Mean temperature: Bucharest, 53° F. (spring), 72° F. (summer), 65° F. (autumn), 27½° F. (winter).
RUSSIA.	Permit required for arms and ammunition. Duty on same, £14 3*s.* 9*d.* per cwt. Shot, 9*s.* 10*d.* per cwt. Gunpowder, by special permission only, 13*s.* 9*d.* per cwt. Loaded cartridges, cartridge-cases,	Fur and large game: In the tundra region—reindeer; in the forest region—weasel, fox, hare (exceedingly common); in the north—wolf, bear, wild boar, hare. Feather: Grey partridge, quail, wild geese,

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Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
and caps, £14 3*s*. 9*d*. per cwt.	wild duck, lark, rook, stork. A list of birds of St. Petersburg shows 251 species. Hunting and shooting give occupation to a great number of persons. Mean annual temperature: Archangel, 32° F.; St. Petersburg, 38° F.; Warsaw, 44° F.; Odessa, 49° F.; Tiflis, 54° F.; Poti, 58° F.
SARDINIA.	
All arms, 8 francs each.	Game scarce: Moufflon, wild boar, hare, lynx. Feather: Pheasant, partridge, quail. (*See also* Italy.)
ST. CHRISTOPHER NEVIS, W.I.I.	
Guns, £1 6*s*. 8*d*. each. Rifles, 10 per cent. *ad val.* Pistols, 13*s*. 4*d*. each. Gunpowder and other explosives, 8*d*. per lb. Ammunition, 11 per cent. *ad val.*	*See under* WEST INDIES.
ST. HELENA.	
All firearms, free. Cartridges and explosives, free.	Fauna scant; rabbit, hare. Feather: Java sparrow, wire-bird, cardinal, dove, partridge, pheasant, guinea-fowl, ringed plover. Mean annual temperature: 60° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
ST. LUCIA, W.I.I.	
On arms, 20 per cent. *ad val.* Gunpowder, 6*d.* per lb. Other ammunition, 20 per cent. *ad val.* Other explosives, 15 per cent. *ad val.*	*See under* WEST INDIES.
ST. VINCENT, W.I.I.	
Guns, rifles, and pistols, 10 per cent. *ad val.*, with additional 10 per cent. on amount of duty. Cartridges and explosives, free.	*See under* WEST INDIES.
SEYCHELLES.	
Guns, rifles, and pistols, $12\frac{1}{2}$ per cent. *ad val.* All ammunition, $12\frac{1}{2}$ per cent. *ad val.*	Fur and large game: Lemur, crocodile, mammalia scarce. Mean annual temperature: 87° F.
SICILY.	
All arms, 8 francs each.	Fauna similar to that of Southern Italy. Mean temperature: $51\frac{1}{2}$° F. (January) to 77° F. (July).

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

SIERRA LEONE.

Breechloaders, single or double, 20*s.* each. Revolvers and other pistols, 10*s.* each. All other arms, 10 per cent. *ad val.* Cartridges, rifle and carbine, 5*s.* per 100. Cartridges, revolver and pistol, 2*s.* 6*d.* per 100. Gunpowder per barrel 100 lb., 6*s.* Other explosives, 10 per cent. *ad val.*	*See under* AFRICA, WEST.

SINGAPORE.

Arms, free.	*See under* MALAY PENINSULA.

SOUTH AFRICA (CUSTOMS UNION: Cape Colony, Natal, Bechuanaland Protectorate, Basutoland, Orange River Colony, Transvaal, and South Rhodesia).

For use of H.M.'s forces, free. Guns, single, per barrel, £1, and 10 per cent. *ad val.* Double or other, 15*s.* per barrel and 10 per cent. *ad val.* Pistols or revolvers, 5*s.* each, and 10 per cent. *ad val.* Other arms, 10 per cent. *ad val.* Blasting compounds, 1½*d.* per lb. Gunpowder and other	Cape Colony. Fur and large game: Panther, lion (occasionally met with), antelope, mungoose, ostrich, springbok, Cape buffalo, Cape anteater. Feather: Secretary-bird (protected by game laws), ostrich, grosbeak, pheasant, guinea-fowl, and aquatic birds.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
explosives for use in firearms, 6*d.* per lb. and 10 per cent. *ad val.* Other ammunition and explosives, 10 per cent. *ad val.* When the produce of the United Kingdom, or the Dominion of Canada, a rebate of one-fourth of the *ad val.* duty is allowed.	Mean annual temperature: 62° F. to 64° F. Umtali: temperature: max. 92° F., min. 57° F.

SOUTH AFRICA (*continued*).

(As already stated.)	The Transvaal: Fauna as Orange River Colony. Tsetse-fly abounds. Mean annual temperature: 68° F. (Durban).

SOUTH AFRICA (*continued*).

(As already stated.)	Orange River Colony. Fur and large game: Springbok, wildebeeste, ostrich, giraffe, mungoose, quagga, antelope, gnu, eland, zebra, Cape buffalo, hippopotamus, crocodile, lion (rare). Feather: Pheasant, guinea-fowl, secretary-bird, grosbeak, etc. Mean annual temperature: 68° F. to 70° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
SOUTH AFRICA (*continued*).	
(As already stated.)	Rhodesia. Administrator issues licence. Price of ordinary licence, £1. Special licence for a person resident in the country, £5. Special licence for any other person, £25. Fur and large game: lion, leopard, buffalo, baboon, koodoo, water-buck, bush-buck, stein-buck, giraffe, pheasant, springbok, hippopotamus, rhinoceros. Feather: Guinea-fowl, pheasant. Mean annual temperature: 64° F., Max. 96° F., min. 55° F.—33° F. has been recorded.
SOUTH AMERICA (Amazon District).	
Single-barrel sporting weapons, 5000 reis and 50 per cent. *ad val.* Double-barrel sporting weapons, 1000 reis and 50 per cent. *ad val.*	Fur and big game: Jaguar, opossum, black tiger, monkey, wild dog, ant-eater, alligator. Feather: Canary-bird, kingfisher, macaw, etc. Mean annual temperature: 80° F. to 82° F.
SPAIN.	
Muzzle-loaders, single and double, £6 1*s.* 11*d.*	Fur and large game: Genet, fallow deer, Span-

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
per cwt. Breechloaders of all kinds, £40 13*s.* 1*d.* per cwt. Gunpowder and ammunition of certain military types prohibited. Cartridges, £1 4*s.* 5*d.* per cwt. Percussion caps, £3 11*s.* 2*d.*	ish lynx, Spanish hare, brown bear, wild cat. Feather: Great bustard, snipe, vulture, Spanish eagle, red-legged partridge, southern eagle-owl, shrike, quail, and wildfowl of many kinds. Temperature varies according to zone. Table-land (Madrid), 53° F.; Southern zone (Malaga), 68° F.; Mediterranean zone (Marcia), 64° F.; Northern zone (Bilbao), 55° F.

SPITZBERGEN.

Arms, free.	Fur and large game: Reindeer (numerous), ice fox, polar bear, walrus, seal, etc. Feather: Petrel, rotches, guillemot, ivory gulls, auk, kittiwake, goose, looms, snipe, eider duck, etc. Temperature: 14° F. (January) to 39° F. (July).

STRAITS SETTLEMENTS.

All arms, free. Ammunition and explosives, free.	*See under* MALAY PENINSULA.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

SUMATRA.

Fur and large game: Orang-outang, elephant, rhinoceros, tapir, tiger, sun-bear, mungoose. Wild dog, antelope, hare, deer, civet.

Feather: Trogon, shrike, rain-bird, pheasant, barbet, woodpeckers, peacock, etc.

Mean annual temperature, 78° F.

SWEDEN.

Guns, rifles, and pistols, £1 8*s*. 3*d*. per cwt. gross. Shot, 5*s*. 7¾*d*. per cwt. Gunpowder, black, 6*s*. 9¼*d*. per cwt. Gunpowder, smokeless, £1 8*s*. 3*d*. per cwt. Cartridges and cases, 19*s*. 9*d*. per cwt. Percussion caps, £3 7*s*. 9*d*. per cwt.

Fur and large game: Wild reindeer, Arctic fox, glutton, roe deer, northern hare, bear and wolf (scarce), elk (common in forest tracts of Central Sweden), hare (in abundance), seal (around coasts), marten, weasel, otter, squirrels, etc.

Feather: Wood grouse, woodcock, snipe, sea-fowl, hawk, eider duck, gyrfalcon, golden eagle, crane, stork, ptarmigan.

Mean annual temperature: 59° F. to 62° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
SWITZERLAND.	
On all arms, £1 0s. 4*d*. per cwt. All ammunition, £1 0s. 4*d*. per cwt.	Game not abundant. Chamois, roebuck, marmot, Alpine hare, etc.; grouse, partridge, wild duck, snipe, etc. Mean annual temperature: Geneva, $49\frac{1}{4}°$ F., Interlaken, 48° F.
TENERIFFE (CANARY ISLANDS).	
All arms, free.	Fauna scant; rabbit, hare, etc. Feather: African vulture, falcon, buzzard, sparrow-hawk, kite, owl, sea-mew, quail, stock-dove, raven, etc. Temperature: 66° F. (January) to 87° F. (September).
TRANSVAAL.	*See* SOUTH AFRICA.
TRANSYLVANIA.	*See* HUNGARY. Fur and large game: Bear, wolf, fox, boar, chamois, and other varieties of game. Feather: Eagle, hawk, snipe, wildfowl, and numerous smaller birds. Mean annual temperature: 59° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*

TRINIDAD AND TOBAGO, W.I.I.

Guns, rifles, and pistols, 6 per cent. *ad val.* Gunpowder, 7*d.* per lb. All other ammunition and explosives, 5 per cent. *ad val.*	Shooting consists of maniti, deer, peccary, pigeons, plovers, snipe, sandpipers, ducks, teal.

TURKEY.

Military rifles and ammunition for same prohibited. Turkish permit required for sporting weapons, endorsed by British Ambassador at Constantinople. Duty, 8 per cent. *ad val.* All ammunition, 8 per cent. *ad val.*	There is no shooting to be got near Constantinople and the large towns. Winter climate is subject to great vicissitudes, mean winter temperature: 41° F.

TURK'S AND CAICOS ISLANDS, W.I.I.

All arms, free. Ammunition, free.	*See under* West Indies.

UNITED STATES OF AMERICA.

All sporting guns, 45 per cent. *ad val.* All rifles of value more than \$10, \$6 each and 35 per cent. *ad val.* Gunpowder and other explosives, 28*s.* per cwt. Caps, 30 per cent. *ad val.* Cartridges, 35 per cent. *ad val.* Shot, 11*s.* 8*d.* per cwt.	Game includes deer, pumas, bear, quail, turkey, ducks, snipe. Excellent sea fishing. Extensive forests, great lumber industry. Climate equable.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
URUGUAY.	
51 per cent. *ad val.* on guns and rifles.	Jaguars, pumas, tapir, wild boar, wolf, deer, water-buck, gazelle, seal (fresh water), carpincho, guanacos, and hares. For birds, ostriches, partridges, wild turkey, swan, doves, ducks, teal, geese, plover, and snipe, a rifle is indispensable. Clothing as for tropical climates for Paraguay. In Uruguay, Argentina, clothes as for England during summer.
VANCOUVER (British Columbia).	
Guns, rifles, and pistols, 30 per cent. *ad val.*	
VENEZUELA.	
Guns, rifles, and revolvers, 24 bolivias per kilogramme.	Fur and large game: Jaguar, puma, ocelot, sloth, ant-eater, ape, wild cat tribe, crocodile, cayman, alligator. Feather: Heron, crane, stork, ibis, duck. Mean annual temperature: 77° F. (hot zone), 65° F. (temperate zone).

Import duties on Guns, Rifles, and Cartridges — *Shooting to be obtained*

VIRGIN ISLANDS, W.I.I.

Guns and rifles, 20*s.* each. Gunpowder, 4*d.* per lb. Caps, cartridges, and cases, 10 per cent. *ad val.*

See under West Indies.

WEST COAST OF AFRICA (Africa, West, including Gambia, the Gold Coast, Lagos, Sierra Leone, etc).

Fur and large game: Giraffe, zebra, hyæna, buffalo, chimpanzee, mungoose, lion, black panther, hydrax, spotted leopard, jackal, gazelle (and other species of the antelope family), squirrel, hare, etc., elephant, genet (around Lake Chad). Hippopotamus and crocodile infest all large rivers.

Feather: Guinea-fowl, sun-bird, Sudanese stork, pigeon, weaver, parrot, dove, flamingo, pelican, heron, duck, goose, sand grouse. Aquatic fowl in abundance around Lake Chad and the Upper Nile.

Mean annual temperature: Freetown, from 78° F. to 86° F.; Lake Chad, from 80° F. to 82° F.

Import duties on Guns, Rifles, and Cartridges	*Shooting to be obtained*
WEST INDIA ISLANDS.	
For use of army, etc., free. For duty on sporting guns and rifles, see under names of various islands—Antigua, Bahamas, Bermuda, Dominica, Grenada, Montserrat, St. Lucia, St. Christopher, St. Vincent, Turk's and Caicos Islands, Virgin Islands, etc.	Mammalia, as in most islands, rare. Agouti abound. Wild pigs and dogs afford good sport, as well as smaller game in the shape of armadillo, opossum, musk-rat, and raccoon. Deer and guinea-fowl (introduced) have multiplied, and are now hunted as game. Feather: Guinea-fowl, trogon, sugar-bird, parrot, humming-bird, water-fowl, and various kinds of pigeon in abundance. Reptiles numerous. Mean annual temperature: Between 77° F. and 82° F.

The information contained in this chapter has been compiled from various sources, including the *Field* newspaper.

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The heavy type in this Index refers to Illustrations

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PLATES

A few Press Opinions upon "THE GUN: AFIELD AND AFLOAT."

By HENRY SHARP.

United Service Magazine.—"Mr. Henry Sharp furnishes in this book a complete guide to home shooting."

Morning Post.—"A sign-post to the right direction."

The Field.—"Long experience well qualifies him to write authoritatively. . . . May be perused with pleasure and profit."

The Graphic.—"It is well written, clear, and in every way suitable as a book of instruction."

The Globe.—"The details given are minute and to the point."

The Badminton Magazine.—"Welcome and serviceable, is written by an expert who speaks from personal experience. . . . Will appeal to all shooting men."

Pall Mall Gazette.—"Mr. Sharp has a good deal to say, and evidently knows what he is talking about."

Aberdeen Free Press.—"The writer has the gift of orderly and lucid exposition, is entirely free from prejudice and egotism, and, with his broad sympathy for tastes differing from his own, is an ideal counsellor."

Birmingham Daily Post.—"In very pleasant and attractive style does he write. . . . Novice and practised hand alike may gain both pleasure and profit from a perusal of his pages. . . . Every line is readable and instructive. . . . Through the whole book there breathes the spirit of the true sportsman."

Sheffield Telegraph.—"Most elaborate yet comprehensive work. Mr. Sharp is entitled to be considered a dependable authority, his chapters simply teem with interest."

Yorkshire Post.—"Mr. Sharp's hints relate to practically every form of sport possible in this country, from game birds to rabbits."

Manchester Guardian.—"The first part deals somewhat exhaustively with guns and ammunition both for ordinary game shooting and wildfowl. Mr. Sharp's consummate knowledge of scientific gunnery and experimental work imparts peculiar value to his remarks on this subject. Mr. Sharp is to be congratulated on the admirable arrangement and scheme of his book."

The Tatler.—"An excellent volume. . . . There is no doubt that it will be read with interest and instruction by hundreds of sportsmen who have long passed the tyro stage. The author has had thirty years' experience in the shooting of game and wildfowl, and if he shoots as well as he writes I do not fancy many birds have escaped him during that time."

The Times.—"Chapters by an experienced sportsman, fully illustrated, not of the reminiscent kind, but intended to help young shooters by full information as to the guns to be used, the game to be shot, and the best methods of shooting it in the British Islands."

The Daily Express.—"A capital book. . . . Is full of the most interesting and helpful hints."

The Glasgow Herald.—"Mr. Sharp is quite entitled to take up the position not only of teacher of the tyro, but of adviser of the seasoned shooting man. He is a well-known contributor to the papers devoted to country sport. The volume is thoroughly practical . . . . quite evidently the outcome of a full mind and the summing up of a wide and long experience. . . . A most attractive volume."

PUBLISHED 1903.

A few Press Opinions upon
"PRACTICAL WILDFOWLING."

By HENRY SHARP.

The Times.—"'Practical Wildfowling,' by Henry Sharp, is a very business-like and instructive treatise on this fascinating but rather exacting pursuit."

The Field.—"No one will regret the appearance of a new book upon a favourite branch of sport, particularly when the writer, as in Mr. Sharp's case, brings twenty years' experience to bear upon the subject. . . . An author who writes from personal observation extending over many years deserves well of all those for whom the book is intended."

The Scotsman.—"The book bears on every page the evidence of a close practical acquaintance with the conditions of fowling, and an intimate knowledge of the various kinds of geese, ducks, and other fowl that fall to the gun of the ingenious sportsman. The second part of the volume considers the manners and customs of the birds. This section of the book, while written in the main with an eye to the needs of a man who wants a good bag, is so well observed, and so interesting, that it will train its readers in the tastes of a naturalist, so that as great an interest can be taken in observing the birds as in bringing them home. The book is plentifully illustrated, and the pictures, without unduly sacrificing æsthetic considerations, have that veracity which is so important and so dear to practical men. In a word, the book is (so far as we are aware) the best manual of its subject that has yet been written; and it may be heartily recommended to the attention of all classes of fowlers."

The Sportsman.—"'Practical Wildfowling' is a valuable treatise. . . . One of the most comprehensive and exhaustive handbooks on the subject which have been written. The illustrations are numerous and elaborate, and the volume should have a place in every sportsman's library."

Black and White.—"A delightful volume. . . . The charm of the work lies in Mr. Sharp's enthusiasm and knowledge, which invest it with interest not to the sportsman merely, but to the journalist."

The Shooting Times.—"'Practical Wildfowling' must be considered a standard work on this particular branch of sport."

The Glasgow Herald.—"Mr. Sharp deals with the pursuit of wildfowl from the standpoint of the practical sportsman. Evidently familiar with all the details of the sport, he writes with an enthusiasm born of a love for his topic, and sportsmen at large will find his advice worth taking in respect of the conditions which are apt to make or mar their success. The illustrations, from the pencil of the author's brother, are executed in a highly artistic manner."

PUBLISHED 1896.