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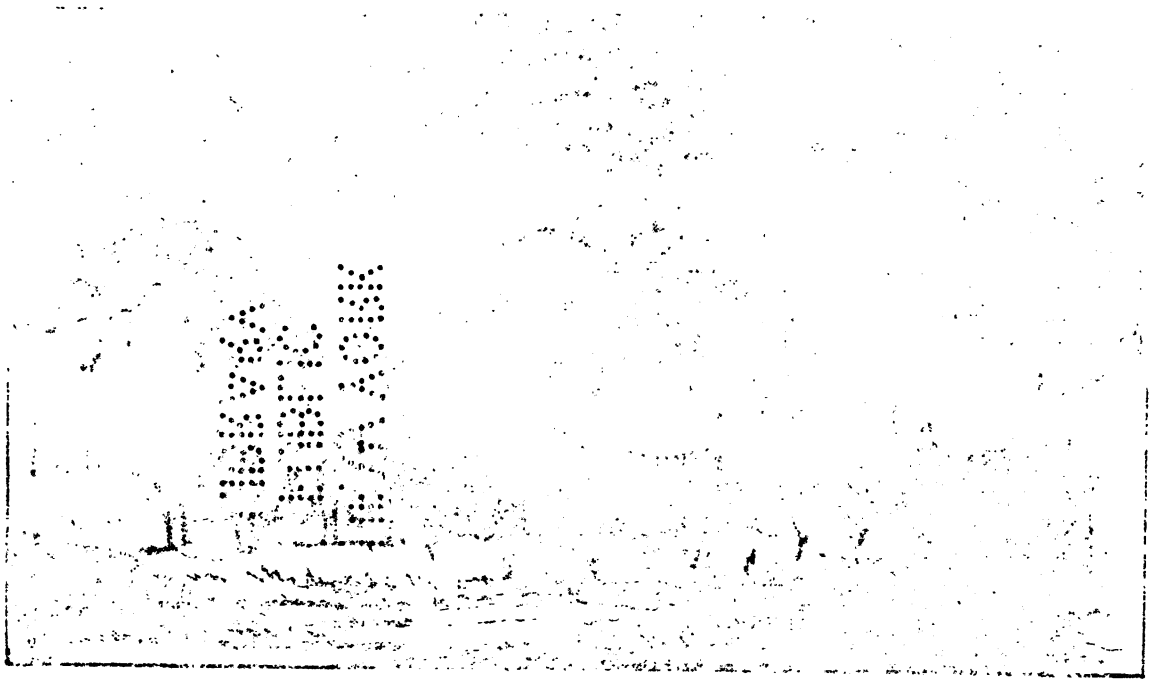

AN INDIAN CAMP.

SPORTING FIRE-ARMS

FOR

BUSH AND JUNGLE,

OR

Hints to intending Griffs and Colonists on the Purchase, Care, and Use of Fire-arms, With useful Notes on Sporting Rifles, &c.

WITH ILLUSTRATIONS BY THE AUTHOR.

BY

CAPTAIN F. F. R. BURGESS,

BENGAL STAFF CORPS.

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W. H. ALLEN & CO., 13 WATERLOO PLACE,

PALL MALL. S.W.

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PREFACE.

THIS little work is not intended for those who are skilled in the use of fire-arms, but is chiefly for the benefit of those young fellows who are about to embark in a career in India or the Colonies, where fire-arms form a useful, if not a necessary part of a man's outfit.

Even if a man is no sportsman, the proper handling of fire-arms is, in these countries, of vital importance in an emergency, such as that of the Indian Mutiny; and I trust that the information contained in these pages may be of use to intending griffins and colonists, especially to those who have no experienced friends to whom to look for advice in the selection of a battery suitable to their wants and means, and on its proper use and care.

To such of them as have a love of sport—and most young Englishmen have—and look forward to enjoying it among the large and small game of their future country, the notes on rifles especially will be found to be of value, as I have endeavoured to bring together, in language as clear of technicalities as possible, all the necessary information concerning them.

Much of the matter contained in these pages has already appeared in an abbreviated form in articles in *Wildfowler's Shooting Times*, from my pen.

I am indebted to Messrs. J. and W. Tolley for kindly revising this work before going to press. Their assistance has, I hope, prevented any technical errors from creeping in.

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the finances does not allow of the purchase of a better one.

The gun should be of 12-gauge, double-barrelled, of plain finish, with back-action locks, which admit of the breech being made of great strength, and with the double-grip lever under the guard action, which, though slower than the various snap-actions, is more durable, and less likely to get out of order.

The barrels should have plenty of metal at the breech end, and should, to be able to shoot ball *accurately* as well as shot, be cylinder-bored. They may, however, be choked on the "tulip" or "recess" system, and yet be able to throw ball fairly well, as the diameter of the bore is not constricted at the muzzle as in the ordinary choke, but is of the same size at the muzzle as at the other parts of the barrel, the "choke" (which is in this case a misnomer) being an enlargement of the bore an inch or two before the muzzle.

The sketches, Figs 2 and 3, Plate I., show the ordinary choke and the tulip choke respectively, with, of course, much exaggerated proportions to give a better idea of them.

Choke-bore guns are said to be, according to the amount of contraction at the muzzle in an ordinary choke, or the depth of the recess in the "tulip" system, "full choked," "medium choked," or "slightly choked"; the amount of "choking" varying from thirty 1,000ths of of an inch in a "full choke" to five 1,000ths in a slight choke. The number of No. 6 shot that a 12-bore gun can with an ordinary load throw into a 30-inch circle at 40 yards varies from about 140, in a slight choke, to 220 in a full choke. Choke-bores shoot with more velocity than cylinder-bores, and, as their shot is more evenly distributed on the target, they are said to make a better "pattern" on it, and give less chance to an animal escaping on account of an uneven or patchy distribution of the shot, even when the gun has been properly held. A small-bore gun can be made to give as good a pattern and shoot as hard as a large-bore; but as the charge of shot is smaller, it will not cover so much space, or make such a large "circle" as a larger bore, which is on this account better adapted for indifferent shots and beginners.

Turner's choke-muzzle attachment can con-

vert an ordinary cylinder-bored gun, fitted with it, into a choke-bore in a minute or two ; it costs about £3 or £4.

A double 12-bore gun, to throw ball effectively, should be about 7½ lbs. weight, and be able to carry 4 drs. No. 6 powder. A bullet mould specially adapted to the gun should be obtained from the maker ; if not, care should be taken not to use a bullet too large for the bore, as a bullet can fit the cartridge-case well and yet be too tight in the barrel. In an ordinary choke-bore, a bullet that fits too tightly at the choke will carry away the muzzle of the gun. Bullets for use in shot-guns should be able to pass easily through the barrel.

The plain cylinder-bore will be found, especially by beginners, to throw quite well enough for most purposes ; but for duck and other wild-fowl shooting a choke-bore will be found most useful ; and I think the cylinder-bore, which is good for ball shooting, fitted with the choke-muzzle attachment, will be found to be the best "all round" gun. A gun of the above description should be obtained for about £12, upwards, with case and fittings.

It would be found useful to have a sling fitted to the gun, as is always done with rifles.

I have mentioned 12-gauge as the most useful size. This is the size most commonly used in India and elsewhere, and it is sometimes an advantage to have a gun carrying the same ammunition as those of the rest of the party one may be with.

Guns of 20 and 16 bore are, as I will note further on, very good for shot-shooting, but carry a far less effective ball than the 12-bore, and cartridges for them cannot always be obtained from up-country dealers. A few steel or brass chambers, which can be reloaded after each shot, may be useful when one may run short of cartridge-cases in an out-of-the-way place.

I will now mention the kind of rifle most useful for general purposes where a small outlay is a consideration.

The cheapest is the Martini-Henry sporting carbine, which can be had for about £5 ; but a single-barrel of 450 bore, carrying the Government ammunition, with a barrel of about 28 inches long and about 8 to 9 lbs. weight, is a

more effective weapon. It should be sighted to carry the ordinary express bullet with 95 grains (3½ drs.) of powder, which is as much as the Government (Martini-Henry) cartridge will hold. With this charge it is very deadly; it has a muzzle velocity of between 1,600 and 1,700 feet per second, and a practically point-blank range of over 150 yards. It will shoot very well with the Government ammunition, the express bullet being substituted for the heavy military one. It can also be used as a long-range rifle with the ordinary military cartridge and bullet, if combination sporting and long-range sights are fitted.

If this rifle is chambered for "express" ammunition it will have a flatter trajectory; but the advantage of having a rifle to carry the Government cartridge is that this ammunition can generally be cheaply and easily procured, especially by military men or volunteers abroad, and no tools, except an express bullet-mould, or not even that, if bullets are taken, are necessary.

For a breech action, any of the kinds that give a clear view through the barrel, and admit of cleaning from the breech, such as the Field,

Henry, &c., are preferable. The Lefaucheux action, similar to that of shot-guns, is not recommended for single rifles. It is not so quickly loaded, and in cheap rifles is apt to get shaky from heavy charges. It has the advantage of allowing the barrel to be detached from the stock, but this can be done in some of the other kinds also.

Silver's "Transvaal" rifle is a cheap, light, and handy weapon, useful, as its name implies, in the Transvaal, and in other countries where attendants to carry a second gun are not perhaps usually available. It is on the Martini system, but its barrel is detachable; and a shot-barrel, which can be carried in a case slung from the saddle or shoulder, can be substituted for it when necessary. Alexander Henry, and Frazer of Edinburgh are also making single rifles on the sliding-block system, with barrels to detach. The stocks of these rifles could, of course, similarly to Silver's, be fitted with shot-barrels.

For sport in South Africa, a double-barrelled gun with one barrel smooth-bored and the other rifled, called the "Cape gun," is to be seen at gun-makers. The shot-barrel is generally 12-

bore, and the rifle-barrel carries either the service ·577 or ·450 cartridges, or express ammunition of any desired size. I do not recommend this gun for India; it is too clumsy and heavy as a shot-gun, and when used as such it has the disadvantage of being a single-barrel only, and is not really necessary in that country, where one can have plenty of attendants to carry a spare gun. One of the disadvantages of this gun is the chance of the wrong barrel being fired by mistake when both are loaded.

The price of a Cape gun is £15 and upwards, for which sum a good plain gun and a sporting carbine can be bought.

It is at the best but a makeshift, but it would be a more useful gun in some cases if both barrels were of one gauge, say 12-bore, and regulated to shoot the same charge with a spherical bullet. The price of a good single rifle is from £8 upwards.

The Martini action is of advantage sometimes, as regimental armourers of course understand it, and can repair it very easily if it gets out of order. It is, however, more clumsy to handle than most others, being awkward in the grip,

and there is no half-cock, though a safety bolt can be used, if fitted. The "Field," and some other actions, can be cocked with the hammer as well as by the opening of the breech, and can, of course, be carried loaded at half-cock.

It will be found to be of great advantage to have a Morris's tube, which carries a ·230 C.F. cartridge, fitted to a rifle. Its little bullet shoots with great accuracy to a long range; it will, if properly directed, strike a 4-inch bull's-eye every time at 100 yards. The tube enables one to use the rifle for shooting small animals, or for getting one's eye in at target practice; its price is from 25s. to 35s., and that of the cartridges 2s. 6d. per hundred. It can be fitted to any sized rifle or shot-gun, and with the large bores a tube of ·300 gauge, taking the regular rook-rifle cartridge of this size, can be used. A Morris's tube fitted to a rifle would save one getting a rook rifle.

Repeating rifles also are cheap, and have the advantage over single barrels of carrying several charges. The commonest are the Winchester ·440 and ·450 bores. The former has too light a charge—40 grains of powder (1½ drs.) and 200

grains bullet—to be an effective weapon, except for small animals; its trajectory, also, is, on account of its small powder-charge, too high at sporting ranges. The ·450 Winchester, taking 75 grains of powder and a solid bullet of 360 grains, is a more powerful weapon; it can with advantage be used with the ordinary express bullet. The ·500 Winchester "express" is a fairly good rifle, about equal in power to a ·450 Martini-Henry with express bullet. Its powder-charge is 95 grains, and its bullet, of the usual express shape, of 300 grains weight, which is, however, rather too light for the size of the bore, on account of its liability to be affected by wind at ranges over 100 yards. The price of repeating rifles is about £6 for the ·440 and ·450, and £7 10s. for the ·500 calibres; higher prices are charged for better finish, pistol-grip stocks, &c. It would be as well, if a repeater is ordered, to have its sights replaced by those of ordinary English sporting pattern, a wide V and a bead.

There are two new patterns of repeating rifles which have just been brought out in America, which are superior to the Winchester ·450 and ·500 bores in power and flatness of trajectory,

and can really be called "expresses." These are the Bullard rifles, of which the ·500 bore takes a charge of 115 grains (4¼ drs.) of powder, and the ·400 bore taking 90 grains (3⅓ drs.). The former of these, if otherwise as good as the Winchester, will make a very useful "all-round" rifle, and the latter a capital rifle for antelope.

The Bullard resembles the Winchester in appearance.

If the tyro is after dangerous game he should not, if possible, trust to one rifle entirely, and never to a single-barrelled one; but should have another rifle, or a shot-gun loaded with ball, as a reserve weapon to be used at close quarters.

The 12-bore gun can be made to shoot ball with sufficient accuracy up to 40 or 50 yards, and its bullet is sufficiently heavy, when driven with a fairly heavy charge of powder, say 3½ to 4 drs., to stop most animals.

CHAPTER II.

The Care and Preservation of Fire-arms.—Their Cleaning and Oiling.—The Examination and Cleaning of Locks.—Their Dismounting and Putting together.—Polishing of Stocks.—White Ants.—The Cleaning and Re-loading of Fired Cartridge-cases.—Brown-paper Cartridge-cases.

GREAT care should be taken of guns, for not only does their efficiency depend on the care bestowed upon them, but they last so much longer and are of so much greater money value when they have been kept in good condition.

On the completion of a day's shooting the arms used should be cleaned; the barrels of double guns should be removed from the stocks, and a piece of flannel, about three inches by six in size, damped with water, should be placed doubled over the jag of the cleaning rod, and pushed through the barrels from breech to

muzzle till the fouling, which is generally caked hard in hot or dry weather, is completely removed. The damp flannel should then be replaced by a dry one, and the barrels wiped till thoroughly dry, when a well-oiled flannel rag should be passed through them in the same way. Rangoon oil is the best to use. Rifle-barrels are cleaned in the same way; the rag used should be big enough to fit the bore tightly.

After the interior of the barrels are cleaned, the actions, stock, &c. should be well wiped and oiled, and then the gun may be put into its case, or put together and placed in the rack. If guns are kept in a rack a cloth thrown over them will keep the dust off; greased felt wads put into the muzzles are good preservatives against rust in damp weather.

Single-barrelled rifles should be cleaned in the same way; if possible from the breech end. If they are cleaned from the muzzle end the interior of the muzzle, which is the most important part of a rifle, on which its accuracy chiefly depends, should be guarded by a brass tube through which the rod can pass; this precaution is especially necessary if a metal rod is

used. Barrels when cleaned from the breech should have their muzzles placed on a soft piece of wood on the floor. Scratch-brushes should not be used; they are apt to damage the polished interior of barrels, and are injurious to rifled ones especially. If scratch-brushes are necessary in shot-guns, to remove leading, brass ones are preferable to those of steel. No emery or other powder should be used for polishing the interior of the barrels or any other part of a gun. The cleaning of guns is very commonly entrusted to native servants; it is much better, if one is really anxious to keep a gun in good order, to clean it oneself; the cleaning of a breech-loader is not a laborious process. Great care should be taken not to place too large a piece of rag on the rod for cleaning a barrel, as it would be apt, especially if the rag is not very evenly put on, to jam or stick in the barrel; and if in the thin part of a shot-barrel, would almost certainly damage or bulge it in the endeavours to push or pull it out. Should a rag stick, it should be burnt out with a thick red-hot wire.

The blocks and actions of single rifles will

occasionally require to be taken out and cleaned. Most of them are simple enough; they only require to be wiped clean and oiled. The Martini action, however, is more difficult for a novice to take down; the knack of doing it should be learnt, as also that of dismounting locks, from an armourer. In damp weather guns should be looked at frequently and kept well oiled to prevent rust. The old oil should be wiped off before new oil is applied, to prevent its caking. Locks require to be examined two or three times a year. If they work stiffly, they either require a little oiling, or are wood-bound from the "side-nails" being too tightly screwed in. If they are clogged by having had too much oil put on them, which has dried and hardened, it will be necessary to dismount and clean them; the cleaning may sometimes be effected well enough by means of a stiff brush, which will save the trouble of dismounting them.

The taking down and cleaning of locks should, as I have already said, be learnt from an armourer or other competent person; but the following are the necessary directions for dismounting an ordinary side-lock. The sketch,

Fig. 1, Plate I, represents an ordinary back-action lock. A bar-lock is similar to it, but differs in the position of the main-spring, which is in front instead of behind.

1. Place the hammer at full cock.
2. Fix the cramp or vice on the main-spring, disengage the sear nose from the notch or "bent" of the tumbler, and the spring can then be removed together with the cramp or vice.
3. To remove the sear-spring, partly unscrew the sear-spring pin, and place the end of a small turnscrew between it and the lock-plate, and prize it up till its "stud" is disengaged from the lock-plate, then complete the unscrewing of the sear-spring pin, and remove the spring from the lock-plate.
4. Unscrew the bridle-pins and remove the bridle and sear.
5. Unscrew the tumbler-pin, which secures the hammer to the tumbler, and remove the hammer. In doing this the lock-plate should be held in the hand, and the hammer, resting in the palm, should

Pl. I

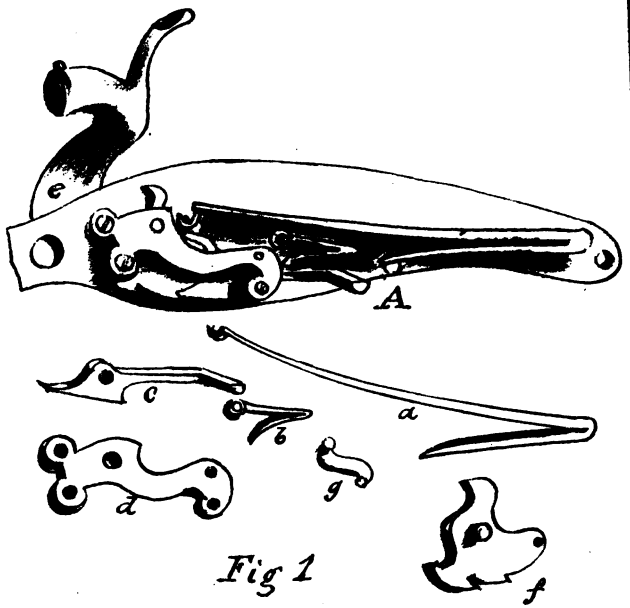


Fig 1

A. Backaction lock, complete.
a mainspring b sear spring c sear
d bridle e hammer f tumbler
g swivel.

Fig 2.

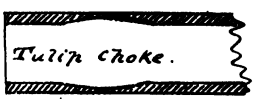


Fig 3.

Fig 4

1 greaseproof wad 2 lubricating wad
3 perforated wad

Fig 5.

1 jute disc. 2 wax or
grease wad. 3 2 jute discs

be tapped on the inside with a piece of wood till it comes off; the tumbler can then be removed and the swivel disengaged from it ; the lock is thus completely dismounted.

To clean the parts of the lock each piece should be well rubbed, first with a dry, and then with an oiled rag, and all caked oil and dirt carefully removed ; but no knife or steel instrument should be used. A lock is put together in the reverse order to that in which it is dismounted ; to do so :—

1. Place the tumbler, in which the swivel has been fixed, together with the sear, in position with the lock-plate.
2. Replace the bridle and screw it home.
3. Fix the hammer in its proper place and screw in the tumbler-pin.
4. Replace the sear-spring, partly screwing in its pin, then force the sear-spring into its proper place, bearing on the sear, with the flat side of the blade of a turnscrew, and when its stud engages in the catch in the lock-plate, complete the screwing in of its pin.

5. Replace the main-spring; to do this the claws of the main-spring should be made to engage in the swivel of the tumbler, the hammer being let down to the position it would be in in resting on the nipple of the gun. The stud of the main-spring should then be made to engage in its catch in the lock-plate; the spring is then in position, and on the hammer being brought to "full cock" the cramp or vice can be removed. The lock is then again in working order.

The following are the names of the parts of the locks in the order they are dismounted:—

1. Main-spring.
2. Sear-spring.
3. Sear.
4. Bridle.
5. Hammer.
6. Tumbler.

When the lock has been put together after cleaning, it should be rubbed with an oiled rag, and a small drop of oil should be put with a quill feather, or fine camel-hair brush, or pin-point, on all the parts of the lock which have to bear friction. The best machine or gun-oil

should be used for locks ; common oils get hard, and clog the working parts of locks.

Stocks should be polished with an oiled rag (linseed oil), and plenty of elbow-grease; wax and oil well rubbed in are also beneficial to them.

In India white ants cause much trouble ; they destroy all articles of soft wood, leather, cloth, &c. which are not carefully protected from their attacks. Gun-cases and all articles of the kind should therefore be placed on bricks away from the walls, which, being very often of mud or sun-dried bricks, are tunnelled in every direction by these insects. A little kerosine oil poured on the floor is a good preventive for white ants.

As cartridge-cases are expensive in India, and other far-off countries, it will often be found necessary to reload them. On uncapping the cases the anvils should be put into a phial containing a little vinegar, and shaken till quite clean. Cap-chambers should be cleaned with a small pointed stick with a little piece of rag, dipped in vinegar, twisted round it.

All brass cases, solid-drawn or coiled, should

be boiled in water, into which a piece of common washing-soda has been thrown, and well cleansed inside and out with a rag and stick after being dried. They should be thoroughly dry before being re-capped. The soda in the boiling water will be found to be especially beneficial in removing verdigris and fouling from fired cartridge-cases that have been kept some time since they were used. Caps should be well pressed home; if they are not so, there will be danger of a premature explosion in closing the breech of the gun, &c. Solid brass cases should be well cleaned, outside as well as in, and may even be polished outside with a little emery paste with advantage. When it is necessary to swedge them, the swedge should be well oiled to make it work properly. Directions for swedging cartridges should be obtained from the gun-maker. Coiled cases can be used about three times. Brown paper cartridges for shot-guns are good enough in India except in rainy or damp weather; they stand reloading well, and are much cheaper than the other qualities.

CHAPTER III.

The Loads for Shot-guns.—Schultze Powder.—Kynoch's Perfect Cases.—Sizes of Shot for various Game.—The Loading of Spherical Ball Cartridges for Large-bore Rifles and Shot-guns.—Buck-shot Cartridges.—Express Rifle Cartridges.—Size of Grain of Gunpowder.—Casting Bullets and Preparing them for Use.—Advantage of Hollow-fronted Express Bullet in Shooting in the Open in a Populous Country.—Machine-made Bullets.—Substituting Express Bullets for Military ones in the Martini-Henry Cartridge.

THE charges of shot-cartridges vary according to the purpose for which they are intended; and all guns do not shoot alike with the same charges. "Wildfowler's" *Table of Loads*, which can be had for sixpence in a neat book form to fit in a gun-case, gives a very good idea of the charges of powder, wadding, and weight of shot suitable for every class of gun and shooting. From these tables it will be seen that to make

a gun throw close, thick wadding is required over the powder, and thin wadding over the shot, and the case not too much turned down; while, to make the charge scatter, less wadding is required over the powder and a pretty thick one over the shot, and the case well turned down. In buying a gun it is as well to ascertain from the maker the best charge to make it perform well under all circumstances. In loading cartridges in India or any hot climate, a grease-proof wad should be placed between the powder and greased felt wad, to prevent the grease from the latter running into the powder and spoiling it when melted by the heat of the sun. A thin card wad between the grease wad and the shot will prevent the latter sticking to it. Chilled shot can now be obtained almost everywhere, and give better results than soft shot, especially in choke-bore guns.

Schultze powder is a good deal used in this country for shot-guns, but I would not recommend its use in India or other hot and dry countries. It is seldom met with in India. It is, as I will endeavour to explain, apt to be very dangerous at times. It has the advantage

over black powder of causing less recoil and smoke, and, when properly loaded, gives results as good as, if not better than, black powder. It has the disadvantage, however, in common with other explosives of a similar nature, of not always giving uniform results, and of occasionally "detonating"; that is, its explosion is sometimes a sudden and instantaneous one, instead of one like that caused by the firing of black powder, of which the gas exerts a gradually increasing pressure. As the straining or bursting of a gun are likely to result from the detonation of a cartridge, as can be seen almost any day in the columns of sporting papers, it is as well to be cautious in using Schultze or similar powders. Detonation may be caused by the excess of fulminate in the priming of a cap, or by the powder being too dry, or from other causes which do not affect black gunpowder, and I would advise the griff or colonist to stick to the latter.

Kynoch's "perfect" cartridges are not suited to guns bored for ordinary paper cases, as they are of larger calibre in the interior by about two sizes than paper ones; a 12-bore Kynoch case

being really about 10-gauge inside; and as the other wads, to fit it, have to be about 10-gauge, it is a rather severe strain on the barrels of an ordinary 12-bore (which are generally of nearly 13-gauge) to have these wads forced through them.

Guns of about 12-gauge to take Kynoch's cartridges should be chambered especially for them, and take the No. 14 gauge case, with which they are said to give better results than guns of the same calibre with paper cartridges. Guns can, however, be bored to take either the Kynoch or an ordinary paper cartridge if required, and shoot equally well with either. This is effected by altering the shape of the "cone" in front of the chamber of the cartridge, converting it from a short into a long one, so that the diameter of the bore decreases very gradually instead of rather abruptly from the chamber to the barrel. The thick Kynoch special wad, which only should be used with this description of cartridge, prevents any escape of gas on the charge passing from the cartridge into the barrel. Cardboard boxes containing wads of all descriptions necessary for loading 500

cartridges can be had. They are most convenient.

Kynoch's cartridges are made of thin metal, and are capable of reloading many times. They are far more easily reloaded than ordinary paper cases; they require nothing but a rammer, or even a stick, to push out the fired caps. As Kynoch's cartridges, however, are not much known in India, and are not yet easily obtained, it will be better to have a gun to take the ordinary paper case. With regard to the sizes of shot, No. 8 or 9 do well for quail or snipe, No. 5 or 6 for partridge, jungle-fowl, hares, teal, &c., No. 4 or 5 for duck, sand-grouse, &c.; for long shots, heavy shot are preferable. The right barrel may, for many kinds of shooting, be loaded with shot of a size or two smaller than the left, which is generally the second barrel, and is only used in case of a miss, and, of course, at a longer range than the right.

The cartridge of the left, or second barrel, should occasionally be examined and taken out and used in the right barrel, as the continuous firing of the right barrel sometimes starts the wads of the left-barrel cartridge.

In loading ball cartridges for shot-guns (or spherical ball large-bore rifle cartridges) the bullet should be placed on the top of the greased wad, and melted wax should be poured over it to keep it secure. A little better shooting can perhaps be obtained by placing a second wad, an ordinary pink-edged or half thick greased felt, with a hole punched out of its centre with a ·450 punch, over the thick felt one, to make a good "seat" for the ball, and keep it steady in its progress up the barrel.

For rifles, the bullet should be used naked, and for most shot-guns a naked bullet is the best, especially if it is cast in a mould especially made for the gun; but some prefer bullets for use in shot-guns to be a trifle smaller than the bore of the gun, and make up for the difference of size by placing the ball in a patch made of linen cloth which is tied or sewn on, and lubricated by being dipped in melted wax and fat, or other lubricant.

No wad should be placed over the bullet, as it is liable to jam in the barrel, and bulge or burst it; and it is not necessary to turn down the case, but the end can be pinched

in a little if the bullet shows signs of being loose.

The charge of powder in a 12-bore shot-gun, with ball, is from 3 to 4 drs. No. 6 grain. When shot-gun cartridges are loaded with buck-shot, the shot should be arranged in three or four layers of three or four shot each. No wad need be placed over the shot, but the case may be slightly turned down, and a little melted wax and tallow mixed should be poured over the shot to keep them steady. The buck-shot should be fitted to the gun, each layer should be able to pass the muzzle without jamming, or danger may arise, especially in a choke-bore. To see if buck-shot fit in a gun, place a wad about half an inch down the muzzle, and put a layer of buck-shot on the wad. They should fit easily to give satisfactory results. If buck-shot fit too tightly in the choke of an ordinary choke-bore gun, they are likely to carry away the end of the gun, or strain it severely.

In loading express rifle cartridges, the powder should be gradually poured in, the case being gently tapped to make the powder settle down, then a thin jute disc should be placed on the

powder, on this again a wax wad or a greased felt one should be placed, then two jute discs, and then the bullet. In putting in the bullet, care should be taken that its paper wrapper or "patch" is not cut, or torn, or rucked up by the sharp mouth of the brass cartridge. Should the mouth of the cartridge be jagged or uneven, it should be carefully trimmed with scissors or file, and slightly opened with the nozzle of a powder-flask, to allow the bullet to go in easily. The bullet should be put in perfectly even and straight, and should be fixed in the case by means of the "bullet fixer" or "clencher."

The powder-charges of rifle cartridges should be carefully measured to get uniform results in shooting; they are sometimes even weighed to grains. The quality and size of grain of gunpowder are of great importance, especially in rifle-shooting. Large-grain powders burn slower and give more uniform pressure in the bore than those of smaller grain. The best sized grain for rifles is generally acknowledged to be for all calibres, from the ·360 to the 8-bore, the No. 6 grain of Curtiss and Harvey's, John Hall and Son's "Field B," Pigou and Wilk's, or other good makers. For

4-bore rifles and large-bored wild-fowl guns larger grain powder is used. No. 6 does very well in the 12-bore shot-guns, but No. 5 or 4 (smaller grained powders) are better, and for 16 and 20 bore guns No. 4 is best.

In casting bullets the mould should be well heated before the lead is poured in; the lead should be melted in a good large iron ladle holding at least 7 or 8 lbs., and a little at a time should be taken out of it, as required, with a small iron ladle, which should be kept at almost red heat. A drop or two of oil or grease will clear the mould of dross, which should be skimmed off the molten lead from time to time. Old Martini-Henry bullets contain a very good proportion of alloy, one thirteenth of tin, and are good material for express and other bullets which require hardening. The mould should be tapped against a piece of wood, or struck with a wooden mallet, to knock out the bullet after casting. It would be spoilt by being knocked against a stone or by being struck with a hammer or other metal instrument. Native servants can do the casting of bullets and other work well, but as they are

apt to be careless, they require good supervision.

Spherical bullets, after being cast, should be trimmed smooth with a knife or file, and all imperfect bullets of any kind should be melted up again.

Express bullets should be passed through the "bullet-corrector," which will bring them to the proper gauge. The hollow front can be filled up either with the copper tube, or with wax, or soap, or a wood plug. The paper patch should be wrapped round them in the direction of the rifling (Plate II., Fig. 4) from left to right, and should go round them exactly twice, as in the Martini-Henry bullet ; this should be very carefully done, or their accuracy will be affected. The use of the paper patch is to interpose as a shield between the bullet and barrel, and prevent leading. If from being badly put on, or any other cause, it gets rucked up on the bullet leaving the cartridge on being fired, it will cause inaccurate shooting. It is torn off by the grooves of the rifling, and does not accompany the bullet on its flight. The tail end of the paper should, after being twisted close to

the base of the bullet, be cut off, and the bullet should, after being heated near a fire, be dipped in melted wax for about a third of an inch from its base ; any surplus wax should then be carefully scraped off.

Some express bullets are not intended to be patched, but have two or three cannelures to carry lubrication ; they should, after being cast, be dipped in melted wax, or, in cold climates, in a mixture of wax and tallow, up to the top cannelure from the base, the surplus lubrication being then taken off by the "bullet corrector," through which the bullets should be passed. They are made of slightly greater diameter than patched bullets of the same calibre, to make up for the difference of the thickness of the paper patch (see Plate II., Figs. 1 and 2).

For shooting in the open in India, solid bullets should not ordinarily be used. The hollow-fronted express ball is far more effective for most purposes, as will be explained hereafter, and solid bullets have a long range even after grazing, and much danger attends their use in a country like India, where so many natives are almost always within rifle-shot,

especially in places where the black buck antelope is to be found. The course of solid conical bullets, after grazing, is most erratic. Express bullets with hollow fronts break up on striking the ground, and do not travel far.

Machine-made bullets are preferable when very accurate shooting, as in target-practice or match-shooting, is desired. They are not cast, but are made in a die; and, being of compressed metal, are of more uniform density and weight.

To replace the military bullet in a Martini-Henry cartridge by an express one, fix the bullet of the cartridge in a vice, and, seizing the cartridge firmly with the hand, draw it steadily away from the bullet, which will be left in the vice; in this way the cartridge-case will not be put out of shape or damaged. The express bullet can then be put in, and the mouth of the cartridge smoothed down on it. If more powder is required, the wads should be taken out with a corkscrew (or, if they have to be replaced, with a penknife, very carefully, so as not to spoil them), and a half-drachm of powder can then be added to the charge, when the wads and express bullet can be put in in the usual way.

To smooth down the mouth of the case it should, after the bullet is placed in it, be rolled on a table, a flat ruler being at the same time pressed on it.

The regulation powder-charge of the M.H. cartridge is 85 grs. or about $3\frac{1}{8}$ drs. ; it will hold almost 100 grs. if the powder is well tapped in.

CHAPTER IV.

Remarks on Light-weight Small-bore Guns and their Advantages.—Large-bore Wild-fowl Guns.—Extra Barrels for Wild-fowl Guns for Ball.—The ·500 Double Express the best "all round" Rifle.—Double and Single Rifles.—Bad shooting qualities of inferior Double Rifles.—Long-range Shooting with Double Rifles.—Price of Double Rifles.—Extra Shot-barrels for Double Rifles.

In the first chapter I mentioned a 12-bore gun and a single or repeating rifle as being the best battery for a man of limited means; but, of course, there are plenty of other guns and rifles which are far better adapted to the various kinds of sport to be obtained in India and elsewhere, and sporting weapons should, as far as possible, be chosen to suit the game against which they are to be used.

The weight of a shot-gun is a matter of some

consideration in India and other hot countries, where every ounce of extra weight is a nuisance; and for all purposes except for throwing ball or buckshot, or for wild-fowl shooting, the 16 or 20 gauge will be found quite powerful enough. They have, saving the occasional difficulty of obtaining ammunition for them, great advantage over the 12-bore in weight and in recoil.

I used a 20-bore full choke for years in India, with quite as good results as the 12-bore, compared with which it seemed as light as a toy, while its recoil was nothing in comparison with that of the latter, which, to me, was a most punishing one. There was a great saving in ammunition also with this gun, as the cartridges were loaded usually with 2 drs. powder and $\frac{3}{4}$ oz. shot, against 3 drs. and $1\frac{1}{8}$ oz. of the 12-bore, so that a pound of powder, an expensive article in India, loaded 120 cartridges against only 80 of the 12-bore.

A choked small-bore gun, however, is not recommended for a beginner, as its killing circle is very small, and it requires very straight holding. It would be better to have the right barrel cylinder, and the left modified choke.

The 20-bore gun I have alluded to was one of Bland's "keeper's" guns, and though of very plain finish, and not of very good quality as regards the locks, was a hard-hitting little gun.

Light weight can be combined with a large bore as in Turner's "feather-weight" 12-bore gun, which weighs only 6 lbs., whilst his 16 and 20 bore guns of this description weigh only 5½ and 5 lbs. respectively. Of course, in districts where wild-fowl shooting is to be had, a large-bore gun of 10, 8, or 4 bore would be a very useful weapon; but it is not everywhere that guns of this kind, which may be classed as special ones, are needed. It would be a very useful thing, if a big-bore gun is taken for wild-fowl shooting, to have an extra pair of short, heavy cylinder-bored barrels fitted, to be used with ball. The gun would then make a good reserve weapon for heavy or dangerous game. A 10 or 8 bore bullet is a very effective one at close quarters for any kind of animal.

With regard to rifles, if only one rifle can be afforded, and the expense of a double rifle is not too great, I think the ·500 double express the best all-round rifle for every kind of shooting.

It is of moderate weight, and though powerful enough to kill almost any animal except the thick-skinned or heavy-boned ones of large size, it will not knock an antelope or small deer to pieces.

I have hitherto only mentioned single rifles and repeaters, but the double barrel is, I think, far preferable for Indian shooting at any rate, or for sport anywhere among dangerous game.

Single-barrelled rifles are best for accurate shooting at long ranges, but a good double barrel will shoot well enough to 200 yards for all sporting purposes. A good one when held straight will put all its shots into a 6-inch circle at 100 yards, and is almost as accurate at 150 yards. Before purchasing a double rifle it should be tested at a target by a good shot to find out whether both barrels throw accurately with the same sighting at all sporting ranges; inferior double rifles very commonly cross their shots, the right barrel throwing to the left, and *vice versâ*, or sometimes one barrel throws higher than the other. The crossing of shots is not a very bad fault at very short ranges, but becomes a serious one at the longer ones, as will be seen from the following instances.

I once tried a double 12-bore rifle by a very good maker, which shot very well at forty yards, the right-barrel bullet striking the left edge of an ordinary square envelope every shot at that distance, the left-barrel bullet striking it in the centre, the two bullets being about two inches apart. At 100 yards, however, while the left barrel put shot after shot into a 4-inch circle, the right barrel invariably sent its bullet more than fifteen inches to the left of the mark; and when aimed about that distance to the right of it, invariably struck it. The shooting of the right barrel could have been improved by moving the sight a little to the right; but the improvement would have been to the disadvantage of the left barrel, the shooting of which would in the same ratio have deteriorated.

Another case of a similar kind was that of a ·500 double express rifle, both barrels of which shot fairly well to 100 yards, putting their shots into or near an 8-inch circle; at 150 yards the bullets of the right barrel formed a group eight or nine inches to the left of the mark, while those of the left barrel formed a group at a similar distance to its right. At 200 yards the

right barrel threw two feet to the left, and the left barrel two feet to the right, which shooting would, at these distances, have rendered the rifle utterly useless in the hands of anyone, however good a shot, for all sporting purposes. At the target, however, this rifle performed very well, and won prizes in matches for double rifles.

As it is impossible to have a double rifle to shoot *exactly* alike with both barrels at the longer ranges, say from 200 yards upwards, the leaf of the sight for 200 yards and longer distances should have its notch cut to suit only one of the barrels, whichever it may be preferred to use, at long distances.

The worst fault, that of one barrel throwing higher than the other, occurred in a double ·500 express rifle by a reputedly good London maker (it was not a cheap rifle either). On its trial at the range in India, one barrel was found to throw about a foot higher than the other at 100 yards.

I have mentioned these cases to show what necessity there is for having the shooting of double rifles tested on the target, for an inferior rifle can be made to perform very well and make

an excellent diagram of its shooting in the hands of an expert who is acquainted with its peculiarities, and yet be, for all practical purposes, utterly useless in the field. The only true test of the shooting of a double rifle is to have it shot by a good marksman who has had no previous acquaintance with, or interest in, the weapon.

The time and labour involved in putting together the barrels of double rifles so as to make them shoot correctly, to say nothing of the expenditure of ammunition in testing their shooting, is very costly, and good double rifles cannot on this account be had cheaply. It is better far to get a good single rifle, and trust to the double gun loaded with ball as a reserve weapon, than to get a cheap and inferior double rifle, if the high price of a good one is beyond one's means. A very good double rifle can be got for £25. I had one by Thomas Turner, a plainly finished ·450, which shot with great accuracy to 200 yards, the cost of which with case and fittings was under £30.

For certain purposes it would be found useful to have a pair of shot-barrels fitted to the stock of a double rifle, say of 20-bore for a ·500

express. A rifle thus fitted would serve the same purposes as the "Transvaal" rifle, which I have already mentioned, and would be useful in a trip in the hills in India where one does not want to be encumbered with unnecessary baggage, and where a shot-gun is only occasionally necessary.

CHAPTER V.

Express Rifles.—Object of the Express system.—Its Flat Trajectory and Velocity. — The ·450 Express and Martini-Henry Rifles compared.—Advantage of Express Rifles in shooting at Moving Animals.—Table showing Weights, Charges, &c. of the various Express Rifles in use.—The new Government experimental ·400 Rifle.—The Marlin-Ballard Repeating Rifle, and another Repeater of the same calibre.—Advantages and Disadvantages of Repeating Rifles.—The "Quick-loader."—Moderate Charges best for most purposes in Rifles.—The Shooting of Rifles affected by the Style of Action with which they are fitted.—Recoil.—Weight in a Rifle necessary to counteract Recoil.—Weight as a Steadier of the Nerves.—"Buck Fever."

RIFLES should be chosen, as far as one's means allow, to suit the work for which it is intended to use them. Rifles on the express system are the best adapted for shooting all kinds of the smaller animals, and all large game of the thin-skinned kind, and have of late years almost

entirely superseded the large-bores for these purposes.

I will now discuss the special merits of the express rifle for sporting purposes.

All projectiles, it is well known, are subject to the law of gravity, and begin to fall, immediately they leave the muzzle, at a quickly increasing rate; the fall in the first second of their flight being 16 feet, in the second 48 feet, and so on. If, therefore, a rifle be aimed direct at any object, without any elevation being given to it to counteract the effects of the force of gravity, its projectile must fall below it.

In the diagram, Fig. 7, Plate II., a rifle is shown with sufficient elevation given to it to enable it to throw its bullet to the mark *b*; it is in reality pointed to a spot a long way above *b*; if it were directed straight at it the bullet would, on account of the action of gravity, fall a long way below *b*. (Of course the heights in the diagram are exaggerated as compared with the distances.)

The express system, however, gives its projectile such high speed up to the limits of sporting ranges that it falls comparatively very little during its flight, and requires very little eleva-

tion at these distances to enable it to reach its mark. A rifle which requires less elevation than another to enable it to throw its projectile to a certain distance is said to have a "flatter trajectory" than the other. Express rifles have practically a flat trajectory up to 150 to 200 yards, so that within these distances the sportsman has the advantage of not requiring to judge the exact distance of his game, but may aim at it with one sight "fine or full," whether it be, say, 50 yards off or 150. The trajectory is the curved path taken by the bullet in its flight through the air, and is best described by the diagram (Fig. 7, Plate II.) The flat trajectory of express rifles is due to the high speed of their projectiles, and this high speed is obtained by the use of powder-charges which are very heavy in comparison with the weight of the projectiles. The weight of the powder-charge is from one-third to upwards of one half of that of the bullet, the speed of which varies, according to the charge, from 1,600 to about 2,000 feet per second on leaving the muzzle of the rifle. The speed at the muzzle is called initial, or muzzle velocity.

The bullet of a good express rifle rises so little

above, or falls so little below the line of sight (which is a perfectly straight one) up to about 150 to 200 yards, that the rifle may be said to have a practically point-blank range up to these distances. The high speed of a light express bullet is not kept up for any great distance, it very rapidly diminishes, while a heavy long-range bullet like that of the Martini-Henry, though it starts with far less initial velocity, does not lose its speed at anything like the same rate ; for instance, a 274-grain bullet fired from a ·450 express rifle with a muzzle velocity of 2,000 feet per second, loses nearly 600 feet in the first 150 yards of its flight. Its speed at that distance is only 1,439 feet per second, while a 480-grain bullet from a Martini-Henry rifle, starting with a muzzle speed of 1,315 feet per second, loses only 211 feet in the same distance, its speed being 1,104 feet per second at 150 yards.

The trajectory of the heavy bullet, however, is very inferior to that of the light one, its height at the highest point of the curve, when fired at a mark at 150 yards distance, being nearly 7 inches, against about $3\frac{1}{2}$ inches in the light

express bullet. The "striking energy" of the two bullets with the above muzzle velocities at 100 yards is for the ·450 express 1,578 foot-pounds, and of the M.H. 1,450 foot-pounds. At 150 yards the striking energy of each is 1,258 and 1,297 foot-pounds respectively.

These facts, which are taken from reports on the trials of sporting rifles published in the *Field* of the 8th September 1883, are given to show the comparative qualities of the express and long-range rifles of the same calibre.

From this, I think that the ·450 express bullet of 320 grains, though it would, to a slight extent, have a more curved trajectory at a short range, and give a little more recoil than that of 270 grains, would be superior to the latter in striking energy or power, and would be more suitable to rifles of this size capable of taking the heavier charges. The high-speed express bullet has a great advantage over one possessing low speed when used for shooting running animals; for, besides its flatter trajectory, it takes less time in its flight to reach its object, and less allowance need be made on that account for a crossing shot. The time of flight of a ·450 express bullet with

2,000 feet per second muzzle velocity is 0·1309 seconds at eighty yards, while that of the Martini-Henry, with 1,315 f.s. M.V., is 0·1911 seconds at the same distance. However, I will touch again on this subject later on.

I will now describe the power of the various kinds of express rifles, which can best be shown in the following tabular form:—

Rifle.	Usual weight of rifle in pounds.	Charge of powder in grains.*		Weight of bullet in grains.*	Proportion of weight of powder to weight of bullet.	Remarks.
		In coiled case.	In solid drawn case.			
·360 or ·380 Express	6 to 8 .	42 . .	50 . . .	130 to 150	About 1 to 3	Flat trajectory to 140 or 150 yards. M.V.† between 1,500 and 1,600 F.S.‡ Suitable for small antelope and other small animals. Can be used as a pea rifle with reduced powder charge and ordinary or spherical bullet.
·400 do. .	7 to 8¼	. .	85 (short), 110 (long)	180 to 220	From 1 to 2·58 to 1 to 1·63	Suitable for antelope and smaller kinds of deer, also for some of the smaller felidæ if its bullet is well planted. M.V. very high and trajectory very flat.
·450 do. .	7½ to 10	Martini-Henry case from 85 to 95. 3¼ in. straight case from 95 to 105.	Straight 3¼ in., W.R. No. 1 "Express" & M.H. solid drawn cases, 120. W.R. No. 2 "Musket" 95 "Magnum Express" case 150	270 to 320	From 1 to 3·17 to 1 to 1·8	Suitable for all antelope and deer; is much used also for dangerous game, but many prefer the larger sizes for this purpose. Trajectory with small charge, flat to 150 yards, with large charge to 200 yards. M.V. from 1,600 to 2,000 F.S. With the same charge as the ·500 Express, and the heavier bullet, it probably almost equals the latter in power, though its bullet has not such a large striking surface.
·500 Winchester Repeater	8¾	. .	About 95 .	300	1 to 3·15 .	Of about the same power as small charge ·450, and suitable for the same kind of work; M.V. 1640 F.S. flat trajectory to 150 yards. This rifle cannot be compared with the English ·500 Express for power.
·500 Express .	8½ to 11	3-in. case 120	3 in. and W.R. No. 2 Express 130, Magnum Express case 160.	340 to 390	From 1 to 3·25 to 1 to 2·12	The best "all round" rifle for general shooting. More recoil than ·450. Rifles of this calibre made to shoot the heavier bullet are far more powerful, and their trajectory is practically as flat as with the light ball.
·577 do. .	10½ to 12	135 . .	Short case 160, long case 190.	480 to 530	From 1 to 3·92 to 1 to 2·52	Too heavy for all-round shooting (recoil severe) except for powerful men, but well adapted for dangerous game, heavy deer, &c., and, with solid bullet, for thick-skinned animals.
·450 Martini-Henry Military	8½	85 . .	. .	480 solid	1 to 5·64 .	This is not a sporting rifle, but is occasionally used as such. It is inferior at sporting ranges in trajectory, but has very great penetration. M.V. 1,350 F.S.

* 27·34 grains = 1 drachm, and 437·5 grains = 1 oz. av.d.p.

† M.V. means Muzzle (or Initial) Velocity.

‡ F.S. means Feet per Second.

NOTES.—Rifle barrels vary in length from 26 to 30 inches in double barrels, and from 26 to 32 inches in single barrels. The Martini-Henry Government rifle-barrel is 33"·3 long, and the M.H. carbine about 21 inches. Single rifles are usually made lighter than doubles, though they can be made of any weight required. Solid Express bullets weigh from 20 to 60 grains heavier than hollow-fronted bullets of the same size.

In some Express rifles it seems to me that too much is sacrificed to obtain an extremely flat trajectory. The 180-grain bullet, for instance, in the ·400 Express, though it has a very flat trajectory, has probably not the striking energy of the heavier 220-grain bullet, and even in the matter of trajectory beyond, say, 100 yards, will not, on account of its velocity being not so well sustained as that of the heavier ball, hold its own against the latter.

The new Government experimental rifle, which is in time, in all probability, to supersede the present Martini-Henry, will, I think, when suitably stocked and sighted, be a very good small-game rifle. It is of ·400 calibre, and its charge of powder is 85 grains in a solid-drawn long taper case. Its projectile weighs 400 grains. Its rifling is not on the Henry system, and has a spiral of one turn in fifteen inches. Its weight as a military arm is about 9 lbs., or a little heavier than the Martini-Henry, and its breech action is the same as that of the present arm. Its accuracy is far better than that of the Martini-Henry, and its M.V. being 1,575 f.s. against about 1,350 of the present service rifle,

its trajectory is far flatter. Its extreme range is about the same as that of the service arm, about 3,500 yards. Its velocity, as reported, is surprisingly high for the proportion the powder charge bears to the bullet, 1 to 4·7, and in spite of its quick spiral; it is practically an "express" velocity, and its bullet being heavy for its calibre compared with an express bullet of the same calibre, which weighs from 180 to 220 grains, its velocity will be far better sustained in flight than that of the light bullet, and will have a flatter trajectory, even at sporting ranges.

This rifle, as it has such speed and flat trajectory with a heavy bullet, would do even better with a lighter bullet for sporting purposes, weighing say from 250 grains as a hollow-fronted, to 320 grains as a solid ball; its M.V. would be even higher, and would be sustained well enough up to sporting ranges.

Mr. Thomas Turner, whose name as rifle-maker is well known in India, tells me he has already made some ·400 sporting rifles on the general plan of the Government experimental one, as regards the barrel, &c., and in accuracy and flatness of trajectory, both with heavy

and express bullets, they give most excellent results.

Another rifle, which has only recently come into use, is, I think, well suited for antelope shooting. It is the Marlin-Ballard repeating-rifle of ·400 calibre, carrying 60 grains of powder in a straight taper case, and a solid bullet of 260 grains. A lighter express bullet could be used, say the 180 or 220 grain one, and its M.V. would be, with the former upwards of 1,650 feet, and with the latter nearly 1,600 feet per second, or about the same as that of a light charge express. It is in appearance much the same as the Winchester, and the mode of working it the same, but the breech mechanism differs. It may be made with a half magazine like the Winchester to carry four or five shots, and its price is about £8 or £9 with loading tools. Of its accuracy, as it has the Ballard barrel, there can be little doubt.

Another repeater of ·400 bore is mentioned by a correspondent of an American sporting paper, the *Forest and Stream*, as being perfected and likely to be shortly advertised for sale. Its charge is 90 grains of powder with a 270-grain

bullet; it will therefore be quite an express in power and flatness of trajectory.

These two rifles will, in point of flatness of trajectory, have great advantages over the repeaters generally in use, the ·440 and ·450 calibres, taking 40 and 75 grains of powder, and 200- and 360-grain bullets respectively.

As to the general question of what advantage the repeater has over the single rifle, it is capable of being fired far quicker until its magazine is emptied, when it can be used as a single loader like any other breech-loader. It has also the advantage that the magazine can be filled and shut off, and so held in reserve, the rifle in the meanwhile being used as a single loader.

The disadvantage of repeaters is that they are complicated, and, according to some accounts, far more likely to get out of order than single loaders, though there is plenty of testimony that they can stand any amount of rough usage in every climate.

I take the following account from a letter to the *Forest and Stream*, dated 10th January, 1883:—

"Most of the guns were carried slung to the

saddle-horn, muzzle downward. During the night which ended our fourth day's march, one of the men who carried a magazine rifle discovered that it would not work. His announcement caused others with similar arms to examine their condition, and the result was that not one magazine rifle was in a condition to be fired a single time in any emergency. The jolting had imbedded the cartridges into each other, point on butt, to such an extent that the machinery was completely and most effectually disabled."

Of course, carrying a repeater for days with its magazine loaded is a trial that no sporting arm is at all likely to be subjected to, but I mention the case to illustrate one of the possible defects of the repeating system. It is, however, only fair to insert the following extract from another letter to the same paper on this subject:—

"I must say a few words in defence of the magazine guns, Winchester especially, in reply to W. N. B. in your issue of the 10th. I have carried a Winchester full of cartridges as a saddle gun since 1871, ridden always with cartridges

in it, and never had it to fail me but once, and then I got a ·45 calibre Colt's pistol cartridge into the chamber by accident. I have been in lots of tight places, and my Winchester has always pulled me through."

A possible danger in a repeater is to be expected from the premature firing of a cartridge in the magazine, which would probably cause the loss of the left hand. This may be due to the action of the spiral spring of the magazine, or to recoil from the firing of a shot in the barrel. The cartridges are placed in Indian file in the magazine-tube, the bullet of one resting against the breech end of the other; and an over-sensitive cap, or a cap not properly pressed home, may be fired by the pressure or jolting of the bullet of the next cartridge. It is therefore important in recapping repeating rifle cartridges to press the cap well into the cap-chambers. Such cases of premature explosion of cartridges in the magazine are stated to have actually occurred during the trial of repeating rifles by the United States Ordnance Department some little time ago, though not in Winchester rifles, which did not compete.

A minor disadvantage of the repeater—and this would not be so much felt in a half-magazine arm—is that the balance of the rifle is altered as the magazine is emptied. Repeaters, in the matter of accuracy are, as is well known, as good as any other single rifles.

The act of working the lever in a rifle like the Winchester may have an unsteadying effect on the nerves on account of the muscular effort required to "pump" in the cartridges; the second barrel of a double rifle has a great advantage in this respect. When the "Quick-loader," with which it is said the new experimental rifle is supplied, is adopted for sporting rifles, they will be almost equal to the repeaters in rapidity of fire, with none of their complications. For most purposes, the use of moderate charges will be found sufficient. Heavy charges give a flatter trajectory and greater power to the ball than light ones, it is true, but more vibration and recoil attend their use. The "bottle" form of cartridge, which is necessitated by heavy charges, has, I believe, a slightly deterrent effect on accuracy, by giving increased recoil and making the barrel "jump." It is not used in

the best match-rifles, where accuracy is the chief object; nor is it, I believe, adopted in the new Government rifle. The kind of action fitted to a rifle has, I believe, something to do with its shooting and sighting, though why it should do so, unless recoil affects different actions in different ways, I do not understand.

I once had a ·450 Henry barrel chambered for the Martini-Henry ammunition fitted to a Snider breech-action. It shot extremely well with 100 grains powder and 270-grain express bullet. As, however, the Snider breech-action was unsatisfactory, I replaced it by a Martini action. On trying the rifle, the barrel of which was of course unaltered, at the range with the new action, it threw about a foot lower at every range, with the same ammunition, than it did before. This defect was cured by having a higher back-sight put on. The accuracy was otherwise quite as good with the Martini as with the Snider action. A heavy man can stand more recoil and shaking, and shoot steadily under it, than a light man, and everyone ought to take his own weight and physique into consideration

in selecting a rifle. Recoil is not felt when shooting at game like it is at target practice, but it undoubtedly affects accuracy, especially if the shooter is lightly built. The recoil of a ·450 express with the heavy charge and light bullet is no greater than that of the Martini-Henry of the same calibre with its comparatively small charge and heavy bullet.

The following table shows the recoil of some of the rifles of Holland's make at the field-rifle trials in October 1883:—

Rifle.	Weight of Rifle.	Weight of Powder.	Weight of Bullet.	Proportion of Powder to Lead.	Recoil in Pounds.	Proportion of Weight of Lead to Weight of Rifle.
	Lbs. Oz.	Grs.	Grs.			
·400	7 14	82	219	1 to 2·66	71	1 to 251
·450	8 4	110	291	1 to 2·72	96	1 to 198
12-bore	13 8	191	583	1 to 3·05	141	1 to 162
10-bore	12 0	223	700	1 to 3·12	163	1 to 120

From the above it will be seen that to meet the recoil of heavy charges the weights of rifles have to be increased; but even then, in the larger calibres, the weight of the projectile bears a larger proportion to the weight of the rifle than in small bores. It is curious, in the

example just given, that Messrs. Holland and Holland's 12-bore is heavier than the 10. A ·450 rifle, to take the light charge of 95 grains and 270-grain bullet, can be made as light as 7 lbs., though it will give better shooting with a pound more weight.

Rifles should not be too light. I once experienced very severe recoil from a ·500 express single rifle, made to order by a very eminent maker, the weight of which was only 7½ lbs.; it should have been about 2 lbs. heavier for its charge of 5 drs. A fairly light rifle is of advantage when one has to carry it oneself; a heavy one is apt to be out of the way when wanted, as it tempts one to hand it over to an attendant to be carried; but, as I have already said, the weight of a rifle, which to a great extent depends on its charge, should be suited to one's strength. Weight has a steadying effect on a man's nerves when he is breathless and excited after a long tramp or stalk after game. It is wonderful how easy it is to miss even a standing shot at a buck or other animal when one is in this state; even at the shortest range it is very different to firing at a target.

The Yankees call this state of excitement "Buck fever," I believe, and beginners are very apt to be attacked by it. The only remedy for it is to take plenty of time to steady oneself, and not to shoot till one has fairly well calmed down and feels pretty certain of hitting; for, not to mention the disappointment of a miss, a badly placed hit only wounds and causes unnecessary pain.

CHAPTER VI.

Effects of Express Projectiles on Game.—A Description of the various Express Projectiles.—The Object of Rifling.—The Degree of Spiral in various Rifles.—Length of Barrels.—Remarks on the different Forms of Grooving.—The Gaining Twist.—Hardened Bullets for Small Bores.

I will now describe the effects on game of the express projectile. The ordinary express hollow-fronted bullet, on striking an animal, after passing through its skin, opens out like a mushroom, and, if the range has been short and speed high, it flies all to pieces inside, cutting and tearing everything to pieces with its fragments, and, in the case of the smaller animals, causes immediate death by the shock. The fragments of the bullet rarely pass through the animal, and there is only one hole in the skin, at the entrance of the bullet. If the speed is lower,

or a small charge is used, the penetration will be greater, as the bullet will not open out so much. At a long range of 200 yards I have known an ordinary Eley's express bullet with copper tube, of ·450 bore and 270 grains weight, propelled by 120 grains of powder, to pass completely through a black buck antelope without apparently opening out at all. It, however, met with no bones in its course. On heavy animals with big bones, especially those with a tough or thick skin, the hollow-fronted express bullet is not at all effective, as it expends its whole energy in penetrating the skin and in smashing itself up on the surface or against a bone, causing an ugly-looking but not necessarily fatal wound. In the case of animals of this kind great penetration is required, and express bullets should, to possess the necessary penetrative power, be hardened, an alloy of one-thirteenth to one-tenth of tin being used. They should have a smaller-sized hollow in their front, or, in the case of some animals, as, for instance, bison, be made altogether solid.

Express bullet-moulds should be provided with plungers of two or three different sizes,

or with adjustable plungers, by which the size of the hollow front can be regulated as desired, or the bullet cast solid. In the case of an express bullet with a hollow of reduced size, the heavy solid base end will travel on and penetrate and smash everything in its way, even when its hollow front is left in fragments near its entrance into the animal's body.

Solid conical bullets for sporting purposes should not be too pointed, an almost flat or hemispherical end is better adapted for inflicting a deadly wound than a sharp, conical point. The pointed bullet has, it is true, greater penetration, but it is easily deflected from its course on meeting with a bone or other hard substance. The sharp-pointed, solid conical bullet, especially if hardened so as to preserve its shape, displaces rather than cuts up the flesh and muscles, and the wound closes up again, so that bleeding is checked. These remarks apply to large-bore as well as small-bore rifles.

The various bullets are shown in Plate II.

Fig. 1.—Section of cannelured express bullet.

Fig. 2.—Section of ordinary express bullet.

Fig. 3.—The same patched and ready for use.

Pl. II

Express Bullets

Paper patch, how applied to bullet

Fig 7

b object aimed at
ab Line of sight
cdb Line of flight of bullet called its Trajectory
de distance from line of sight to the highest point in the curve of the Trajectory; the less this distance is, the "flatter" the Trajectory is said to be. It is called the height of the trajectory.

Pl. III

1

2

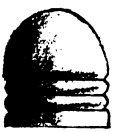
3

1 & 2 Express bullet after striking

4

5

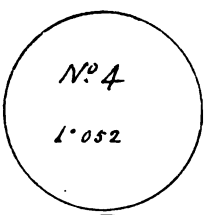
6

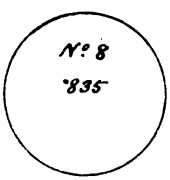


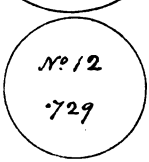
7

8

Large bore bullets







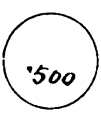


Fig. 4.—Shows the way in which the patch-paper is wrapped round the bullet.

Fig. 5.—Lord Keane's sectional bullet.

Fig. 6.—The same partially opened out at the point to show the cross-cuts.

Plate III., Figs 1 and 2.—Side and end views of ordinary express bullets after striking with medium velocity.

Fig. 3.—Section of express bullet with reduced hollow.

Fig. 4.—Solid express bullet after striking.

Fig. 5.—Solid base end of express bullet with reduced hollow after striking.

Lord Keane's sectional bullet is divided into four pieces from its point to about a third of its length by a cross-cut; it is supposed to have much the same effect as an ordinary express bullet, but it weighs about the same as a solid ball of the same size. The ordinary Martini-Henry bullet can be made into a most effective projectile for dangerous animals by being cross-cut with a fine tenon-saw at its point in the same way as Lord Keane's bullet (see Fig 6, Plate III.), the point being dipped in melted wax to fill up the cuts. It will then combine the expan-

sive effect of the express bullet with great penetration. The cuts should be about half an inch deep.

As most express rifles are intended to shoot only express bullets, which are usually comparatively short ones of about two diameters in length, they are rifled with only a sufficient spiral to suit these short bullets, and if long bullets, such as the Martini-Henry, of about three diameters in length, are fired out of them they will not shoot straight, as the bullet will not keep point foremost in its flight, but turn over and go sideways.

The object of rifling is to give a rotatory motion or "spin" to the bullet, which has the effect of keeping it point foremost during its flight, and gives it great accuracy. Rifling also has the same effect on a spherical bullet which is fired from a barrel which it fits properly; the "spin" keeps the end of it, which was at the front in starting, in that position during its whole flight. Of course the conical bullet has the advantage over the spherical of the same weight of offering a smaller resisting surface to the air. The finer-pointed bullets are slightly better for

accuracy than blunt or round-ended ones, but are not so effective for sporting purposes.

The degree of spiral necessary to spin a bullet varies according to its length, and to some extent to the velocity of its flight. The highest speed express rifles, using also, of course, the heaviest powder-charges, require a less rapid spiral than those with less velocity. The following table will show to some extent the degree of spiral of some of the rifles in use.

Rifle.	Weight of Bullet in Grains.	Approximate Length of Bullet in Diameters.	Spiral, one complete Turn.	
			In Inches.	In Calibres.
·400 Experimental Government	400	3½	15	37·5
·450 M.H. . . .	480	3	22	48·8
·450 Express . .	270	2	35 to 45*	77·7 to 100*
12-bore (·750) .	580 spherical 800* conical	1 spherical to about 1½ conical*	90 to 120*	120 to 160*

Rifles with a sharp spiral can shoot short express bullets well; the Martini-Henry, for instance, does so, but the slower spiral is better adapted for high velocities, as there is less loss of power from friction. There is also the chance,

* Approximate.

if a light bullet is fired out of a sharp-twist rifle with a very heavy charge, that it will "strip" or pass out of the grooves, and, of course, have an erratic flight. Long barrels give higher velocities than short ones with similar charges; the slight advantage, however, of a little increased velocity is counterbalanced by the unhandiness of a long barrel.

In the experiments of the United States Government, their service rifle with a barrel of 32 inches gave 100 feet per second higher velocity than the carbine taking the same ammunition, the barrel of which was 22 inches long. The M.V. of the rifle was 1,350 f.s. against 1,250 of the carbine, the charge being 70 grains of powder and 405 grains of lead. The spiral of both was the same, one turn in 22 inches and the calibre ·450. About 26 inches for double, and 28 inches for single rifles is the best length for barrels.

There are various forms of grooving in use for rifling; of these the most common in use for English rifles is the well-known Henry rifling. The actual form of the grooves does not seem to be of so much consequence as regards accuracy;

for most of the systems now in use, though they vary considerably in this respect, give pretty nearly equal results in accuracy at the targets, and are all much on a par for sporting purposes; but of late years shallow-cut rifling has been found to give the best results, to whatever system it belongs. It is easier to clean, and has less tendency to become fouled; for the lubricating wad, and the bullet itself, have a better chance of clearing out the fouling left by the preceding shot if the rifling is moderately shallow than if it is deep. Those forms of rifling which have as few sharp angles as possible are the best in these respects, and some of the present systems are almost, if not quite, equal to a smooth-bore in affording facility for cleaning. Thomas Turner's and systems resembling his are very easily wiped out; but Lancaster's oval bore is the nearest approach to, and is practically, a smooth-bore.

Rifling is not always made with a uniform spiral. In some systems it begins with a slow twist at the breech, and gradually increases to a quick one at the muzzle, say from 1 turn in 100 calibres at the breech to 1 in 50 at the muzzle. This kind of rifling is called the "gain

twist." Its object is to decrease recoil and friction; otherwise, I believe, it has no advantage over the uniform twist.

All conical bullets for rifles taking heavy powder-charges, especially small-bores, require a certain amount of hardening. The explosion of the large charge expands or "sets up" their base ends so that they fit the bore tightly, and pure lead bullets are too soft, and yield too much to the pressure of the powder gas, and are too much "set up" and disfigured by it. They have further the disadvantage of causing unnecessary friction and recoil in their passage through the barrel by being too thoroughly moulded into the grooves by the upsetting process.

Hardened bullets offer more resistance to setting up, and give better results in small-bores.

Naked or "cannelured" unpatched bullets of soft lead are apt to lead the barrel.

CHAPTER VII.

The Necessity for using powerful Rifles for Heavy Game.—General Description of Large-bore Rifles.—Table of Weights and Charges, &c. of Large-bore Rifles.—Explosive Bullets and Shells for Large-bore Rifles.

If animals of the heavy and thick-skinned classes are to be hunted, it is sometimes necessary to use weapons of greater power than those of the express kind. The express system is amply sufficient for all animals of the thin-skinned kind, even the most dangerous ones, if weapons of suitable size, and taking the proper projectiles, are used. For instance, a friend of mine who has had much experience in large-game shooting, bagged in the year 1882 four tigers with only five bullets from a ·500 express double rifle by Tolley; the charge used was 116 grains or about

4½ drs. of powder, and Eley's 340-grain ordinary express bullet.

Of course even the lightest bullet will occasionally kill a big animal by chance, as in the case mentioned in the Indian papers lately, where a man out shooting pea-fowl with a rook rifle came suddenly across a tiger, and, as the beast was preparing to attack him, he had no alternative but to fire, which he did, aiming at the eye; the result being that the tiny bullet penetrated the animal's brain, killing him on the spot. Such good fortune, however, could not be expected once in a thousand times, and what is wanted for large and powerful, thick-skinned and heavy-boned, or ferocious beasts, is a weapon that propels with a heavy powder-charge, at a good high velocity, a ball of good weight and penetrating power, with a large striking surface, capable of smashing heavy bones and inflicting a paralysing shock which will kill or disable the animal, or at any rate render it powerless for mischief till the sportsman can put another ball or two into him and finish him.*

* A hardened 8-bore conical bullet, with 10 drs. of powder, will penetrate fourteen hard wood planks, each

A rifle for heavy game should be capable of *stopping* an animal instantly. Such a weapon is to be found in rifles of 12-gauge and larger sizes, throwing spherical or short round-ended conical bullets, or as is sometimes, though not now-a-days frequently preferred, explosive bullets or shells. Rifles of this kind are not intended for the longer sporting ranges; most of their shooting is done at distances under 100 yards, and they have flat trajectories up to and beyond this distance. They should be sighted to shoot most accurately at the shortest distances, and even at 15 or 20 yards should not throw an inch high, for a very slight error vertically may make all the difference between a kill and a miss, and endanger one's life.

Before express rifles were introduced, the usual breech-loading rifles for general shooting were of large calibre, varying from 16 to 12 gauge. The smaller sizes are rarely met with now, but the 12, 10, or 8 gauges, which are now

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an inch thick, at short range, as can be seen in a target of this description at Messrs. Tolley's. This is immense penetration, considering the large striking surface of the bullet.

usually made as powerful as possible for their calibre, the power of the sportsman to carry weight and stand recoil being taken into consideration, are the large-bore rifles now used, and are reserved entirely for heavy and dangerous game.

Till the late Captain Forsyth of the Bengal army wrote his book, *The Sporting Rifle and its Projectiles*, about twenty years ago, and introduced his slow-twist rifling and heavy charges for large-bores (his system applied to small-bores gave birth to the modern express), rifles were loaded with what to us seem ridiculously small charges of powder of 1 to 2 drs., which was necessitated by the excessively deep grooving and quick spiral of the rifling then in vogue, which caused the ball to strip with a heavier charge, and the speed of their bullets was in consequence very low, and trajectory high. Leaf sights to give elevation had to be raised for any distance over 50 or 60 yards. When more power and speed was desired to be given to the projectile, the smooth-bore, which could fire a sufficient load of powder, had to be used, though of course accuracy had to be sacrificed. The

powder used in former days, too, was very fine-grained and quick-burning, and a big charge of it strained a gun considerably more than the large-grained kind now used.

The following table gives useful information about large-bore rifles; it is compiled from a report in the *Field* of the 8th September 1883, by the kind permission of the editor.

Rifle.	Weight lbs.	Length of barrels.	Charge.		Proportion of weight of powder to weight of bullet.	Initial velocity. Feet per second.	Velocity at 100 yards. Feet per second.	Striking energy Foot-pounds.		Greatest height of trajectory at 100 yards range in inches.	Remarks. All these rifles were by Messrs. J. and W. Tolley.
			Weight of powder in grains.	Weight of bullet in grains.				At 40 yards.	At 100 yards.		
Single 4-gauge Elephant Rifle	20	25½″	328 or 12 drs.	1882 conical 1252 spherical	1 to 5·73 1 to 3·81	1330 1460	1160 1099	6597 4659	5619 3351	Nearly 2·8 2·7	No. 7 Curtiss and Harvey Powder.
8-bore double ditto	16¼	26″	273 or 10 drs.	1257 conical 862 spherical	1 to 4·59 1 to 3·15	1500 1654	1272 1193	5847 3998	4511 2720	Nearly 2·2 2·2	No. 6 ditto.
10-bore double smooth-bore gun.	10⅛	25¾″	136 or 5 drs.	698 spherical	1 to 5·106	1316	At 40 yds. 1146 At 100 yards 966	2033	1445	Nearly 3·5	No. 6 ditto.

It will be seen from the above table that the spherical bullet, like the light express one, loses velocity very rapidly.

The diagrams in Plate III. show approximately the sizes of the different calibres of rifles and guns. The exact diameters of the larger calibres are as follows:—

No. 4	Bore,	1·052 in.
„ 8	„	·835 „
„ 10	„	·775 „
„ 12	„	·729 „
„ 14	„	·693 „
„ 16	„	·662 „
„ 20	„	·615 „

The 12-bore is nearly always stamped "13," being smaller than ·729.

Fig 7, Plate III. is a short hemispherical-ended large-bore conical projectile, suited for a slow-twist rifle intended for spherical ball. Fig. 8 is a longer large-bore bullet, suitable for a rifle with a quicker twist. Explosive shells are occasionally used; any bullet with a hollow front, like the ordinary express bullet, can be made into an explosive bullet by filling the hollow with explosive mixture and stopping the mouth with a plug of wax. The best explosive mixture is composed of equal parts, by weight, of chlorate of potash and sulphuret of antimony; the mate-

rials should be ground separately into fine powder, and only a very small quantity, sufficient for one or two shells, should be mixed at once. This can best be done on a clean china plate or piece of glass with the feather of a quill pen, the nib end of which can be used to fill the shell. Bullets filled with this explosive are perfectly safe to handle, and stand rough usage without danger and will not explode unless propelled with great force against an object, or struck very violently. The materials of the explosive should be mixed perfectly dry; *if mixed wet, it becomes very sensitive.*

There are some explosive bullets, or rather shells, with copper cores or chambers to hold the explosive, of which they are capable of holding a larger charge than the hollow-fronted bullet. The copper cores are held in position in the bullet-mould by a plunger, while the lead, which should be allowed to run in very gently, is being poured into the mould. On the bullet being cast, the plunger is withdrawn, and leaves a hole by means of which the explosive can be introduced into the shell. This hole is closed with wax, or a shot pellet jammed in.

The copper core of the conical (Dougal's) shell is bottle-shaped (Plate IV., Fig. 5), and that of the spherical shell (Plate IV., Fig. 4), which is known as Meade's shell, is spherical-shaped. Meade's shell being very light, is suitable for use in smooth-bore shot-guns. Its accuracy, however, is, on account of its lightness, not good except at very short range, about thirty or forty yards. Forsyth's shell, capable of holding a large charge also, is suitable for large-bored rifles. It is cast in two pieces. The front portion contains the explosive, and when it is filled the two pieces are put together and swedged in a machine. When complete, this shell has the appearance of a solid bullet. See Figs. 6 and 7, which show Forsyth's shell before and after swedging.

CHAPTER VIII.

Effects of Explosive Bullets and Shells.—Their Advantages and Disadvantages.—Express Bullets used as Explosive Projectiles.—Anti-recoil Heel-plates.—Finger Guards.—Smooth-bore Ball-guns.—The Macleod Bullet for Smooth-bore Guns.—Breech Actions of Double Rifles.—The Purdey Bolt Snap-action for Shot-guns.—Bar and Back-action Locks.—The Material of Rifled and Smooth-bore Barrels.—Steel and Twisted Metal.—Belgian Gun-barrels.

SINCE large-bore rifles have arrived at their present state of perfection in power and accuracy, the use of explosive bullets has to a great extent gone out of fashion, and opinion varies a good deal among Indian sportsmen as to their efficacy for big game shooting. They have not usually the penetrative power of the solid ball, and have to a great extent the disadvantages, which I have already pointed out, of the express hollow-

fronted bullet; there is no doubt, however, that, if they do not explode prematurely on striking a bone near the surface, and penetrate well into an animal, their effects are most deadly. The effects of the explosion of half a drachm or so of explosive mixture in the interior of an animal must give a terrible shock to the system, in addition to that given by the projectile itself.

Ordinary express bullets, loaded as explosive shells, are very useful in black-buck shooting in a populous country. They are very deadly, and if they miss they explode on striking the ground, and the fragments do not range far.

For rifles or guns firing very heavy charges, an anti-recoil heel-plate is advisable. They save the shoulder of the firer from being bruised by the recoil, and make shooting much pleasanter. Silver's heel-plates are the best for this purpose; they are made of a combination of hard and soft india-rubber and are very neat.

A finger-guard for the trigger-finger also is desirable when using heavy loads, especially in firing the left barrel. It saves the trigger-finger from being bruised or cut by the right

trigger when the gun recoils. The finger-guard is made of india-rubber.

Smooth-bore ball-guns, generally of 10-bore, are heavy, but lighter and handier than rifles of similar bore. They are useful as second guns for close quarters and for howdah shooting, where shooting is done at a very short range. They are almost, if not quite, equal to rifles of the same gauge in power and accuracy at very short ranges. Their barrels are usually stouter and shorter than those of shot-guns.

The Macleod bullet is intended for use in smooth-bore guns; it is cylindrical in shape, and rotation, similar to that of a rifle bullet, is given to it by the air passing through four holes or passages, larger at the front end than in rear, which run through it lengthways and obliquely. It is said to have the accuracy of a rifle ball, but I have had no experience in its use, so I can say nothing on this point.

My remarks on this projectile are, of course, as I have not tried it, open to criticism, but I think the following points should be noted: Its weight, for the 12-gauge, is nearly 2¼ oz. against 1¼ oz. of the spherical ball of the same gauge;

and a charge of 3 drs. of powder would give a far heavier recoil with it than with the spherical, with far less velocity and a much higher trajectory, the proportion of powder to lead of a 3-dr. charge being, to the Macleod bullet 1 to about 11·8, and to the sperical bullet 1 to 6·7. Besides the disadvantage of increased recoil, which, I think, must undoubtedly exist, its heavy weight, aided by its length and cylindrical shape, with its large surface exposed to friction, must cause a far greater strain on the barrel and action of a gun than the spherical ball, the periphery of which only is exposed to friction;* so that I think great caution is necessary in using it in a light shot-gun, or one not especially built for ball. I think even a strong ball-gun would be subjected to an undue strain in using it with a 3-dr. charge. A charge of about 6 drs. would be necessary to give the Macleod bullet

* The Macleod bullet, not fitting the bore tightly, does not expose the whole of its surface to friction against the barrel; but if it is at all "set up" it must be subjected to a large amount of friction, in any case to a far greater extent than a spherical bullet, which only touches the barrel at its periphery.

a fairly high muzzle velocity of about 1,100 or 1,200 f.s. And this, of course, except in a very strong and heavy gun, would be quite inadmissable, considering the weight of the projectile; and heavy weight in a projectile, it is well known, has more effect in causing recoil and strain, even with a moderate charge of powder, than a light projectile with a comparatively heavy charge. A shot-gun could, I think, for this reason, stand a powder charge of 4 to 5 drs. far better with a spherical bullet than 3 drs. with a Macleod bullet.

As to trajectory, Messrs. Tolley assure me that with the 3-dr. charge with which they have tried the Macleod bullet, it is very bad in comparison with that of a spherical bullet. The shape of the Macleod bullet does not seem well adapted for penetration, though it would undoubtedly give a good blow to an animal if it had sufficient speed when it struck; but speed is a quality in which this projectile must be, as I have already shown, deficient. The action of the air in making the bullet spin must offer great resistance to its progress and cause great loss of velocity. The shape of the leading end of the

bullet, a perfectly flat surface, is the worst adapted for encountering resistance from the air.

Breech-actions of double rifles should be of great strength; and the old double-grip lever under the guard, which I recommended for plain strong shot-guns, is the best for rifles also. (See Plate IV., Fig. 1.)

The locks should be back-action, for the reasons already given; and for all express and large-bore rifles, or wild-fowl or ball-guns using very heavy charges, a good top fastening is necessary in addition to the double grip under the barrels. The most common is the "doll's head," and it is sufficiently good, but some of the top fastenings are of very great strength, and are—as for instance Greener's cross-bolt, or Tolley's giant-grip, or Westley Richards top-bolt—able to hold the barrels without any grip under them at all, though the two former are used in conjunction with other fastenings.

For ordinary shot-guns, the Purdey bolt is a very good fastening, it is quite strong enough; but it is not so simple as the double-grip lever, and is more difficult to get repaired abroad if it gets out of order. Any such actions with the

extended rib or doll's head top fastening are far more difficult to repair than the ordinary kind, and this is a point to be noted in arms for rough use abroad. Figs. 2 and 3, Plate IV., show the sections of the ordinary double-grip lever breech-action fitted with bar and back-action locks respectively. From these it will be seen how much more metal is cut away in the former than in the latter. The shaded portion shows the solid metal left in each action, and the greater strength of the action fitted with back-action locks is self-evident. No double *rifle* should have bar locks. The great objection to back-action locks is that they weaken the grip or handle of the gun, so much wood being cut away to admit the main-springs. The grip has, in consequence, to be made a little thicker than in bar-lock guns. It is, however, the choice of two evils. It is better that the stock of the gun should break across than the action, as the latter accident would be far more disastrous in its consequences. In a sound, well-made gun, the bar-action is safe enough. In a cheap gun the back-action lock should be insisted upon.

Rifle barrels are generally made of steel, bored

out of the solid, while those of shot-guns are made of twisted metal, known as Damascus, stub-twist, &c. The materials and mode of manufacture are fully described in Mr. Greener's book *The Gun and its Development*, and in *The Modern Sportsman's Gun and Rifle*, by the editor of the *Field*.

Steel is the best material for rifle barrels, as it takes a finer polish, and the grooves of the rifling can be cut with greater accuracy and finish in this metal than in the twisted metal, the fibres of which run across the direction of the grooves, and are more likely, in case there may be slight defects in welding, &c., to allow rust spots or "pits" to form where these defects occur. Such defects are, of course, far less likely to occur in a solid homogeneous metal like steel.

The importance of having a perfectly smooth polished surface in the interior of rifle barrels is best shown by quoting from an article written by Messrs. J. and W. Tolley on rifle-making, which appeared in the *Shooting Times* of January 25th, 1884: "Not only does the smooth finish of the cut in the grooves in the rifling influence the accuracy of the shooting, but it also much reduces

the tendency in rifles using exceptionally heavy powder-charges to lead the barrels in rapid firing." From this it will be seen what necessity there is for exercising great care, in cleaning rifle barrels, not to scratch or injure their interior in the least.

Twisted metal is best for shot-gun barrels, as they are comparatively thin. It is also, perhaps, best for light large-bore rifles having thin barrels. If steel barrels were to burst, they would be more likely to burst violently than twisted metal ones, on account of the fibre of the latter, which runs spirally round the barrel, stretching and giving way gradually. Steel of the kind ordinarily used for rifle barrels is not suitable for shot-gun barrels. Belgian twist barrels, which are generally found in cheap guns, though they look very well, are softer than those of English manufacture, and do not stand rough usage or keep their good shooting qualities so long.

CHAPTER IX.

Pistols.—Cheap and Small-sized Pistols of no Use for Real Service.—The ·455 Revolver.—The Enfield Pistol.—Webley's, Tranter's, and Colt's Pistols.—American Pistols with Heavy Charges.—Table showing Charges of Revolver Cartridges.—Colt's "Frontier" Revolver as a Carbine.—Self-extracting Revolvers.—The "Pull off" of Revolvers.—Their Accuracy.—Disadvantages of Revolvers.—Lancaster's Four-barrelled Pistol.—Double-barrelled Pistols.—Rook Rifles.—The Sighting of Rifles.—Aiming.—Focussing of Rifle Sights.—Description of Sights.—Sights for Night Shooting.—Lyman's Sight.—Beach's Combination Sight.—The Telescope Sight.

THOUGH pistols do not belong to the sporting class of fire-arms, yet, as they may occasionally have to be used abroad, it will not be out of place to say something about them.

All the smaller-bored and short-barrelled revolvers, and cheap ones, usually of Belgian make of any kind, are more or less unreliable. The small sizes, though their bullets will kill if they wound in a vital part, will not generally stop a man, especially in the excitement of a

fight, while the short-barrelled pistols are wanting as a rule in accuracy, and have not the power of the long-barrelled ones. Cheap pistols will probably be found to be out of order when most urgently required, and it is very false economy to get them.

For military men and others going to India it is advisable to have a pistol taking the ·455 Government ammunition, which is, together with the ·450 old-pattern revolver cartridge (which also fits this pistol) to be obtained from arsenals, and regiments, and from the principal dealers in the country. In India, military men can provide themselves, if they desire it, with the Enfield revolver, which can be had on payment from Government. This pistol is the new Government arm, and is on the self-extracting principle, but differs in its extracting mechanism from any other pattern that I have seen. It is a well-balanced, accurate weapon.

There are many excellent pistols taking the ·455 ammunition. Of these I think the best are Webley's and Tranter's, both of which can be had either of the self-extracting, or of the ordinary pattern ; they are both double-action in both

patterns. The Colts' and Adams' double-action non-extracting revolvers, are also excellent pistols. Should a more powerful revolver be required, I should recommend the Colts' ·440 "Frontier" pistol, taking the Winchester rifle cartridge, or the Smith Wesson ·440, or ·450, all of which revolvers take much heavier charges than the English ·455.

The following table shows the charges of powder of some of the revolver cartridges in use, which would be most serviceable for real work:—

Cartridge.	Charge.		Proportion of powder to lead.	Remarks.
	Weight of powder in grains.	Weight of bullet in grns.		
·450 old-pattern Government.	13	225	1 to 17·30	Bullet with deep hole behind, soft lead; cannelured.
·455 new-pattern Government.	18	265	1 to 14·72	Bullet with deep hole behind, hard lead; cannelured; wax wad.
·450 U.S. Government.	37	250	1 to 6·75	Cannelured.
·440 Colt's (Winchester) "Frontier."	40	200	1 to 5	Ditto.
·440 Smith Wesson.	25	250	1 to 10	Ditto.

From this table it can be seen how much more powerful the three last cartridges, which are of American pattern, are than that of our Government. English revolvers to take the American cartridges can be purchased in London, as well as those of American manufacture. All the above cartridges can be reloaded and used several times over. The average weight of ·455 military revolvers is $2\frac{1}{2}$ lbs., and their barrels are about $5\frac{1}{2}$ to 6 inches long. They are good belt-pistols. The Colts' "Frontier" revolver has a $7\frac{1}{2}$-inch barrel, and can be used as a carbine with an attachable stock; it is a very simple, strong, useful, single-action pistol, well adapted for rough usage. It has a good recoil with its heavy charge used, as a pistol, with one hand.

Self-extracting revolvers are more handy for loading, especially on horseback, than the old pattern; they are, however, more complicated and likely to get out of order. The price of good revolvers is from about £2 12s. for Colts' single-action, to about £6 or £7 for the best self-extracting ones.

The "pull off" of revolvers ought to be light,

not above 2 or 3 lbs. A fair shot should be able to put most of his bullets, using one hand to hold the pistol, into a 6-inch circle up to thirty paces. It requires much practice to make good shooting with a revolver, especially if the self-cocking action is made use of. It should only be used for close quarters in a *mêlée*.

There is considerable loss of power from escape of gas between the chamber and barrel of a revolver, and on this account as well as from the shortness of its barrel, a revolver does not propel its bullet with anything like the power that a rifle firing the same charge would.

Lancaster's four-barrelled pistol, taking the revolver-cartridge, gets over the difficulty of the escape of gas. Its four barrels, put together in two pairs, are all fired by one trigger. There is one lock which acts on the striker of each barrel in turn, the cocking being effected by means of the trigger, as in a double-action revolver; there is no outside hammer.

Double-barrel breech-loading pistols, to take the cut-down Snider or Martini-Henry cartridge (·577-bore) with spherical bullets and about $1\frac{1}{2}$ drs. of powder, are more effective weapons

than revolvers, but they have the disadvantage of only having two shots.

A 16 or 12 bore heavy double-barrelled B.L. pistol, generally smooth-bored, carrying 2 drs. of powder and a spherical bullet, is occasionally used as a sporting weapon in Indian shooting. It is found to be very handy in emergencies, and can sometimes be used under circumstances when a longer weapon cannot be handled. It is useful on account of its portability as a *dernier resort* when a man is in danger of being mauled by a dangerous animal, and has not the chance of using a better weapon.

Breech-loading double pistols are more expensive than revolvers. They are usually made with double-grip action and back-action locks like a gun. Rook or pea rifles are useful for practising at a mark and for shooting small animals, pea-fowl, &c. Besides the Morris's tube which I have already mentioned, there are many excellent miniature rifles to choose from, the cost of which is from £3 upwards. Of these the Martini-Zeller, by Adams, of Finsbury Pavement, is a good one for the price; but, of course, the more expensive ones, such as Holland's,

which are celebrated for their accuracy, are better. The ·380 or ·360 is the best size for abroad. These rifles carry very well to about 150 yards ; they have a flat trajectory to about 60 or 70 yards. Their charge of powder is about 15 to 20 grains, and bullet about 150 grains, the initial velocity being about 900 to 1,000 f.s. They are handy little weapons to have in camp, as they are useful in many cases where it would be a waste of ammunition to expend an expensive express cartridge. Express bullets do very well in them. I once bagged a chinkara gazelle at over 100 yards with one out of a ·380 Martini-Zeller. The ·380 cartridge-cases reload many times, and cost only about 2s. 6d. a hundred. A mould, recapper, and swedge are necessary.

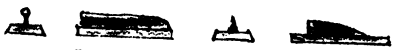
The ·380 and ·320 Winchester repeaters are very good rifles ; the former is almost equal in power to the ·360 express. Its load is 38 grains (1½ drs.) of powder with a 160-grain solid bullet ; an express 140-grain bullet can be used also. This rifle would do for small antelope shooting.

Having described the various kinds of arms, I

will now enter into the matter of sighting of rifles, which is a most important one, as the accuracy of a rifle is of no avail if its sighting is incorrect.

Sporting sights usually consist of a "bead" at the muzzle (Fig. 1, Plate V.) and a V-shaped notch near the breech (Fig. 2). Aim is taken by getting the object desired to be struck in line with the bead of the foresight and the bottom of the notch of the backsight (Fig. 3, Plate V.). In aiming at an object with a rifle it is usual to close the left eye, and only use the right one. Some very good shots shoot with both eyes open, and it would be an advantage if everyone could learn to do so: no doubt it would come by practice. It is well known, of course, that most people keep both eyes open in shooting with shot-guns, but then there are no sights to align. The focussing of back-sights is important; they ought to be placed at such a distance from the breech that when aim is taken they appear clear and distinct, and not blurred. Eye-sight differs, but about eight to ten inches in front of the breech is about the position for back-sights which will suit most people.

Pl. V

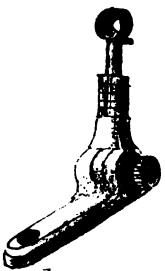


Bead Knife edge

1 Foresights

narrow wide

Aim taken by placing bead be-low object



Lyman sight

Beach combination fore sight

Appearance of Globe foresight as seen through Lyman sight.

Open protected foresight.

The V of the back-sight differs in form. Some prefer a deep, narrow V; others a wide, shallow one; the latter I think the most useful for sporting purposes, as it gives a clearer view of the game.

The centre of the back-sight is very commonly defined by a fine platinum line, which is of advantage when the sunlight does not fall upon it and dazzle the eyes. Of this matter, however, I will speak later on.

Occasionally the back-sight is a plain bar, without any notch at all, the centre being defined by a fine line. For some lights it is probably the best. It is, perhaps, easier to get the correct elevation with it than with the V-shaped sight.

The fore-sight is sometimes of the kind known as the "knife-edge." This kind, though very good for target practice, is not suitable, as a rule, for game shooting, though a few men prefer it. It is well defined against the clear white colour of a target, though it cannot be seen well against the neutral colour of an animal's skin, and one is apt to aim too high at game when using it. For ordinary lights the ordinary black fore-sight is well adapted, but for

shooting in twilight a silver-tipped or ivory fore-sight is preferable. It could be made interchangeable with the ordinary one.

Sometimes it is necessary to shoot in the dark, and various contrivances are used to make the end of the barrels and sights visible to enable aim to be taken. A piece of white paper or cotton-wool fixed on to the muzzle is generally used for this purpose, and one of the Calcutta gunmakers advertises a luminous foresight for night use, but I have not seen it.

Night shooting, however, is at the best but uncertain work, and should only be attempted in the absence of other means of getting game. It is usually resorted to for shooting tigers, panthers, &c. from "machams" or platforms, on posts, or trees, or other safe places, a live bait in the shape of a bullock or kid being tied up near the place to attract the game.

The American Lyman back-sight (Fig. 4, Plate V.) is well adapted for antelope shooting, it can be used with the ordinary bead or "globe" fore-sight. Aim is taken through a peep-hole of about one-tenth of an inch in diameter. A smaller sized peep-hole can be brought into use, if desired,

for target-shooting, by an ingenious mechanical arrangement in the sight.

In aiming with the Lyman sight, the object aimed at is seen with the bead well defined against it, through an indistinct kind of halo, which does not interfere with a clear view. For accuracy combined with quickness of aim it is, perhaps, one of the best sights devised; if the object is covered by the bead of the fore-sight seen through the centre of the peep-hole, it must be struck, provided the rifle is accurate and steadily held. It has, however, the disadvantage of taking up space on the "handle" or "small" of the gun, and its bed-plate interferes with the hand, and may probably hurt it with its sharp corners, when heavy charges are used, in the recoil of the rifle.

These sights are well suited to rifles of the usual American pattern, which are, according to our standard, heavy for the charges they use, and have comparatively little recoil, and for deer-stalking or antelope-rifles, but I think they would be out of place in the heavier double rifles.

The best fore-sight to use with the Lyman

73805

back-sight is the Beach combination sight, which can be used either as a covered bead or knife-edge sight (Fig. 5, Plate V.).

Another sight deserves mention, though it is suitable for deer-stalking or antelope-rifles only, —this is the telescope sight. In those which I have seen, of Henry's and Frazer's patterns, the tube of the telescope is of metal like a gun-barrel, and is strong enough, being firmly fixed on the rib of the rifle, to stand tolerably rough usage. Crossed hairs, like those of a theodolite telescope, give great accuracy of aim. Of course the telescope magnifies the object, and assists the sight; the eye-piece is lined with India-rubber to prevent possible damage to the eye of the firer from recoil.

The telescope is about sixteen or eighteen inches long, and has the disadvantage of being rather heavy, and, of course, is a rather clumsy adjunct to a rifle. Its price is high, about £9; it is not in common use.

CHAPTER X.

Remarks on Rifle-Shooting.—On the Correction of Faults in the Sighting of Rifles, and the Cause of the Bad Shooting of some Rifles.—On Aiming.—Shooting in a High Wind.—Shooting at High Elevations above Sea-level.—Sights of Shot-guns.—The Distances to which Sporting Rifles are sighted.—Long Shots unsportsmanlike.—Combination Express and Long-range Rifles, and their Sighting.—The Sighting of Large-bore Rifles.—On Aiming with Express Rifles at very short Ranges.—"Position" in Shooting.—Correct Holding.—Pressing the Trigger.—"Pull-off" of Triggers.—On "Dwelling" on the Aim.—Sights to be Upright in Aiming.—On Aiming at Moving Animals.—On Shooting Down-hill.—Safety Bolts on Rifles.—Gun-bearers and Loaded Guns.—A Caution.—Rebounding Locks.

RIFLE-SHOOTING is a science, and accuracy of shooting of any kind can only be acquired by practice. No two rifles, however much alike, will shoot exactly the same; and a man, to make

the best use of his weapon, must become familiar with it. A good shot behind an inferior gun will make a far better bag, *cæteris paribus*, than a duffer with the best weapon that money can procure. Practice with a rook-rifle or Morris's tube will be of great assistance in teaching a beginner to shoot. A rifle which will shoot accurately enough with one man will, perhaps, be found to throw high with another; this may be on account of some difference in eye-sight or peculiarity of holding. In long-range target-shooting, two men will sometimes make equally good shooting with similar rifles and ammunition, though using different elevations. A rifle will throw slightly higher when the trigger is pressed with the second finger instead of the fore-finger. If a sporting rifle is found to throw high, it is a bad fault, and should be at once corrected by cutting the V of the back-sight a little deeper; this can be done on the range, experimental shots being fired, and the sight gradually cut down till the right depth is reached. A fine file should be used, and care should be taken not to scratch the barrel. The back-sight in sporting rifles is removable, being fitted by being dovetailed into

the rib, and can be removed by being tapped on the side with a wooden mallet, or by striking a coin, held against its side, lightly with a hammer; the little screw, which is sometimes used to keep the sight in the centre of the rib, being first taken out. The original black colour of the sight can be restored by heating it red hot in a lamp-flame and dipping it in oil. In replacing the sight care should be taken to place it exactly in its proper position. Where there is no small screw to fix the back-sight, there are usually small linear marks stamped both on the sight and on the rib, which coincide with each other when the sight is in its right place. Some rifles throw high on account of the gunmaker having given them a fictitiously flat trajectory to a long range, by making the standing back-sight too high, or, what amounts to the same thing, by making the rib on which the sight stands too high. In cases like these, if it is found impracticable to lower the V notch by filing, the fore-sight should be replaced by a higher one.

If a rifle is found to shoot to one side the back-sight should be moved in the opposite

direction to correct this fault. A high fore-sight has the disadvantage of being weaker and more exposed to rough usage, and is on this account generally either mounted on a raised rib or stud, or is protected by a couple of projecting pieces of metal as in the Martini carbine (Plate V., Fig. 8).

If a rifle throws slightly low, it is rather a good fault ; but if it shoots too low, either a lower fore-sight or a higher back-sight must be fitted. Most makers regulate the shooting of their rifles for the aim to be taken with the bead placed *below* instead of *on* the object fired at ; if aim is therefore taken with the bead on the object, the result will be a clean miss high over it. Details of this sort should be enquired into on purchasing a rifle. Aiming with the bead below the object has the advantage of giving a clearer view of it (Fig. 3, Plate V.), but it is merely a matter of accustoming oneself to one style or other of aiming. In aiming with a covered globe fore-sight, as in the Beach sight, the bead, which is supported on a long slight stalk, which does not obstruct the view, is laid on or covering the object.

With the knife-edge sight aim is best taken by placing the top of the sight just under the object. In shooting in a high wind allowance must be made for the projectile being deflected by it; express bullets, being light, are very sensitive in this respect, much more so than heavy long-range bullets of the same calibre, and it is sometimes necessary to aim as much as a foot or more to the windward side of a mark at hundred yards with a ·450 express. If the wind is gusty, it is almost impossible to make good shooting, as the wind not only affects the bullet, but unsteadies the barrel of the rifle. Practice on a range on a windy day will soon show what allowance or "wind-gauge" is necessary.

The height above sea-level affects, I believe, to a considerable degree, the velocity of a rifle bullet; the higher above sea-level it is fired, the longer range it will have; due, I believe, to the air being rarer at great heights. This is a point to be noted by those who, like the sportsmen in the Himalayas, shoot at considerable heights above sea-level. A few shots at a mark will show to what extent rifles are over-sighted

for the longer sporting ranges at high elevations above the sea.

Shot-guns have a small bead-sight; but though aim is not taken as with a rifle, it undoubtedly assists the eye. Gilbert's sight is highly spoken of by some, but I can offer no opinion on it, as I have not tried it. It is, I believe, said to have advantages for those who have some defect in their eye-sight. Elevation, in order to get longer range, is given in sporting-rifle sights by hinged leaves, which are raised for the distances required. Cheap and inferior rifles are usually only regulated to shoot at the shortest distance, if they are regulated at all, and the leaf marked "200," for the 200-yards range, will be generally found high enough to shoot at double that distance. Of course it can be cut down to the proper height. For most sporting purposes a distance of 250 yards is quite far enough for a rifle to be sighted up to, indeed a shot at 200 yards even is a long one. The vital parts of an antelope, for instance, are only contained in a space equal to a circle of less than a foot in diameter, and that is not a large mark at over 200 yards. Of course a lucky shot in the neck,

or head, or spine, will kill; but these parts, except at short range, are too difficult to make certain of, and a hit on them at long range is more or less of a fluke. A long shot is unsportsmanlike; it is more likely to wound, and cause unnecessary pain, than a shot at short range, and an antelope hit too far back will go for miles, and escape only to die a lingering death, or to fall a prey to wolves, &c.

Single rifles may be sighted for longer ranges, and those small-bore rifles, with a quick spiral, using a moderate charge, say 85 to 95 grs. of powder, which can shoot both the express and long-range bullet, can with advantage be sighted for either. Sights for rifles of this description can be made with a standing sight for 100 to 150 yards, and one or two flaps for longer ranges, for the express bullets, and a long flap and slide, similar to those of military rifles for long ranges, up to 800 or 1,000 yards for the heavy bullet. This long flap with slide folds flat, and does not interfere with the aim taken with the express sights, which are placed behind the long-range sight. Sights of this description are known as "combination express and long-range" sights.

Large-bore rifles are sighted in a similar manner to expresses, but have, more frequently than the latter, "flush" sights; that is, there is no standing back-sight at all, and the flaps for every distance fold quite flat with the rib, and are not used at the shortest ranges, under 100 yards. This is an advantage in snap-shooting, as the view of a moving animal is not obstructed in the least. It would perhaps be an advantage to have the back-sight of all rifles having a rib, flush. Fore-sights should, for very accurate shooting, be as "fine" or small as is consistent with strength. A "coarse," or large bead has a tendency to make one shoot high, and no fine shooting can be done with it; if laid on an object it covers it entirely.

Large-bore wild-fowl guns have occasionally back-sights of the "flush" kind, with a flap or two for long shots. As express rifles are usually sighted with the standing sight for 150 yards, at intermediate ranges, say 50 to 100 yards, aim should be taken very fine, or slightly low, as the bullet rises an inch or two, more or less, according to the height of the rifle's trajectory at these intermediate distances, above the line of sight.

And now, having gone into the matter of sighting, it is necessary to say something on "position" in shooting, holding, &c. The sportsman should be able to shoot in any position. In stalking it will occasionally be necessary to take a kneeling, or a crouching, or a sitting shot, so as not to expose oneself to view, and even the lying down or "prone" position may be useful at times, and the beginner should learn and practice them all; but the standing position is the one from which game is most frequently shot. A good position in shooting comes naturally to some, but in the majority of cases it is best learnt from a good shot. Practice at a target will soon show a man what position suits him best.

Rifles or guns using heavy charges require to be held with the butt well pressed into the hollow of the shoulder. The consequences of the recoil of a loosely-held rifle, especially a heavy one, are very disagreeable: a bruised shoulder and cheek are the results, and I have even seen a man's collar-bone broken by the recoil of a loosely-held musket with a heavy charge.

A pistol grip enables a rifle to be more firmly

held and pressed into the shoulder; it should be fitted to all rifles, and is comfortable to use even with shot-guns. Shot-guns are sometimes fitted with the "half-pistol" grip. The trigger should not be pulled with a jerk, but should be pressed firmly with the fore or second finger directly the firer is sure of his aim; it should not be done in a hurry—a hurried shot is usually a miss.

In pressing the trigger in rifle shooting, the thumb should be placed behind the hammer, or in a corresponding position in a rifle without a hammer, pressing against the stock (the Martini has a hollow for the thumb), as it enables the finger to press more steadily. If the hand of the sportsman is not large enough to get a firm grip of the Martini rifle, the second finger should be used to press the trigger.

The "pull-off" of triggers should not, for sporting rifles or guns, exceed 3 lbs. The shape of a trigger and its "set" have a great deal to do with the weight of the pull-off; a trigger leading well back seems easier to pull than one set almost at right angles to the stock, though they may both have the same weight of pull-off.

A heavy pull-off is not conducive to accuracy whether in a gun, rifle, or pistol; and the heavy pull-off, 6 or 7 lbs., of military rifles is only to make them safer when used by clumsy or inexperienced men.

Too long a time ought not to be taken over the aim, the trigger should be pressed at once when the mark is seen in its proper position over the sights, and the shooter should hold his breath in pressing the trigger. If the shooter tries to make his aim more perfect the strain on his sight and nerves increases, and the aim generally becomes worse instead of better. The first aim is the best. If a steady aim is not got at the first attempt it is better to pause and take breath, and even take the rifle down from the shoulder to steady oneself, before trying again.

The rifle should be held perfectly upright, so that the axis of the barrel and the line of sight may be in the same vertical plane; if the rifle is inclined to one side, the bullet will be thrown to that side and go low. In shooting at running animals aim should be taken some distance ahead of them, say about 3 to 4 feet in front of an antelope moving at the rate of 12 miles an hour,

at a range of 100 yards with an ordinary express rifle.* If the shooting is in the open, it is best, perhaps, to aim at a spot on a level with the shoulders or other part of an animal's body which it is desired to hit, some 15 or 20 yards ahead of him, and to press the trigger immediately it arrives at the right distance from the point at which it is necessary to shoot. Snap-shots at running game in brushwood or jungle are more difficult, and the rifle must be used more or less like a shot-gun, as there is no opportunity for aligning sights. A short-barrelled, handy, flush-sighted rifle is best for this work, so as to handle as much like a shot-gun as possible. In shooting down-hill the tendency of the rifle is to throw high, aim should therefore be taken rather below an object when firing at it from a height above it. It would be most useful to try a rifle in shooting at a mark both down and up hill, to see how much allowance is necessary.

Some sporting rifles are fitted with sliding bolts for locking the hammer at half-cock, so that the gun may be carried, when loaded, with

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* See page 119.

safety. These bolts were necessary enough in the days of the muzzle-loader, which could not be unloaded when not immediately required, and was often carried loaded by gun-bearers; but there is not so much need for them now, and they will often be found worse than useless, as the gun, when required to be used suddenly, will often, from an oversight or accidentally, if the bolts work loosely, be found to have its hammers bolted. I think the disadvantages of safety-bolts almost outweigh their advantages; and the best precaution against accidents lies in the care with which a loaded gun ought to be handled by the sportsman himself.

Very great care should be taken in entrusting gun-bearers with loaded guns, whether they have safety bolts or not. A sad accident took place a few years ago by which a fine young fellow lost his life, shot dead accidentally by his gun-bearer who was walking in front of him carrying a rifle over his shoulder with the muzzle pointing towards him. If loaded guns are given to attendants to carry, they should be made to keep the muzzles pointing upwards; but the best plan is to avoid entrusting them with loaded guns, if possible.

Rebounding locks are now generally used in guns—they are more convenient in reloading, as the breech can be opened without first cocking the gun; but they are occasionally liable to cause miss-fires, as some of the strength of the main-spring has to be exerted in making the hammer rebound, and the force of the blow on the striker or piston is thereby lessened. They are used sometimes in rifles; but as a miss-fire in a big-game rifle is a serious matter, it is as well, perhaps, not to use them. They enable a loaded gun to be carried more safely, and are advantageous in this respect, and if of really good material and workmanship, are to be recommended in preference to ordinary locks. Their mechanism is very similar to that of ordinary locks, the rebound is caused by an extension in length of the lower arm of the main-spring.

CHAPTER XI.

Description of the Standing Position.—"Position Drill."—Snapping.—Aiming with the Shot-gun.—Shooting at Moving Objects with Shot-gun.—General Remarks on Shooting at Moving Objects.—On the Fit of a Gun or Rifle.—Remarks on the Measurement of Guns and Rifles, and on the Directions to be given to the Gunmaker in ordering these Weapons.—On the Provision of Ammunition, Gun Fittings, &c. for use Abroad.—Hammerless Actions.—Repairs to Fire-arms in India.—Native Gunsmiths.

In the previous chapter I mentioned that the standing position is that from which game is most frequently shot, and it is perhaps as well to give a description of it in as simple language as possible. (My military readers may, of course, skip it.)

In firing standing, the weight of the body should be supported on the left foot, which should be pointed to the front, or in the direction of the object aimed at; the right foot should be

placed about ten inches behind and to the right of the left, pointing to the right front; both legs should be straight, and the knees should not be bent.

The rifle should, while aiming, be supported by the left hand, which should grasp it at a short distance in front of the breech-action. It should rest in the palm of the hand, the fingers closing round it, but not so as to obstruct the sight, and the thumb should rest between the stock and barrel. The left elbow should be well under the rifle, and should not stick out sideways. The rifle should be well pressed into the hollow of the shoulder by the left hand, and should be grasped at the small or handle of the butt by the right hand, the thumb of which should be placed behind the hammer, or in a corresponding position in a hammerless rifle, and the fore or second finger should be placed well round the trigger, the remaining fingers closing round the handle or pistol-grip of the butt. The right elbow should be raised almost level with the shoulder, which should be slightly thrown forward. The head should be bent forward, so as to bring the right eye on a level

with the sights, which may best be aligned on the object by raising the muzzle of the rifle, which should point a little below it.

Some men in aiming bring the rifle down on the object instead of raising it. It is said this method makes a miss high in a hurried shot less probable. A little of what is known as "position drill" will do a novice in the art of shooting no harm. The rifle should be frequently brought to the present (the aiming position) at a small mark to enable the hand and eye to work together, and to accustom the arms to its weight and handling. With a little practice it will be found to cover the mark almost as easily as a shot-gun.

If snap caps, which allow the hammer to fall harmlessly, are used, "snapping practice" should be done both with gun and rifle, as it is most useful in accustoming one to pressing the trigger steadily while aiming.

In using the shot-gun, no aim, as understood in rifle shooting, is taken. The eyes, both open, should be kept on the bird or other game; and the hand and the eye working together, the gun will be found to cover it, and the necessary

allowance on account of the motion of the game can then be made.

A regular "aim" should not be attempted in shooting with a shot-gun, and the trying to get it leads to a "poking" style of shooting which is never very effective.

Shot-guns as well as rifles should be held well pressed into the shoulder to counteract recoil. A shot-gun should be directed *below* a bird going away, and *above* it if approaching; the amount of allowance varying according to the height of the bird above the shooter. Very little allowance need be made for a bird flying low. The distance necessary to hold ahead of a moving object can only be learnt by practice; but I will take the case of a bird flying across at the rate of 30 miles an hour (44 feet a second) at a distance of 40 yards from the shooter; the mean velocity of shot being taken to be at this range, say 600 feet per second, it would be necessary to direct the shot 3 feet in advance of the bird to hit it. The distance to hold ahead of course varies according to the animal's speed and the direction in which it is moving; if it is approaching or going away obliquely,

less allowance is necessary than if it is going straight across. The rate at which animals move, and the mean speed of projectiles being known, the amount of allowance necessary for any distance is easily calculated *on paper*, but in the field the knowledge can only be gained by experience.*

It is necessary to have a gun or rifle to properly fit the shooter. A good fitting weapon "comes up" well,† and in pointing it towards any object, it will be found to cover it on the eye being run along the rib. In ordering guns and rifles, several should be put up to the shoulder to see what kind of a stock fits best, and "comes up." A stock which is too short is most uncomfortable to use with an arm taking a big charge, the recoil will be most severely felt, and a stock which is too long is unhandy and will not come up quickly.

Directions for measuring the length and bend of the gun will be found in most gunmakers' circulars. If the purchaser has had no experi-

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* Page 112.

† *I.e.* comes up to the "present" or aiming position.

ence of guns, it is as well to let the gunmaker fit him ; or if he cannot see him personally, he should state his height and whether he is short or long-necked, and give the length of his arm from the top of the shoulder-joint to the end of the middle finger.

The measure of a gun can be taken as follows: a straight-edged piece of wood should be placed along the rib of the gun, or the gun should be placed with its rib against the straight edge of a table, and the distances from the straight edge or table, which should be long enough to come up to the butt-end of the gun, should be measured in inches and eighths as follows (see Fig. 1., Plate IV.) :—

1st. To the "comb" or point of the stock just behind the handle *a* to *b*.

2nd. To the heel of the butt, *c* to *d*.

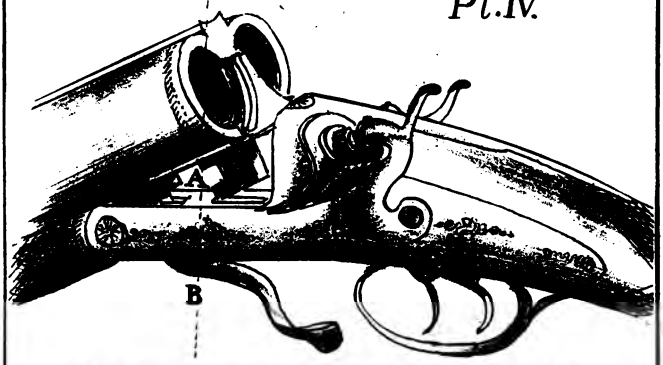
These measurements give the bend.

3rd. From the centre of the right trigger to the centre of the heel-plate, *h* to *f*.

4th. From the same to the heel of the butt, *h* to *g*.

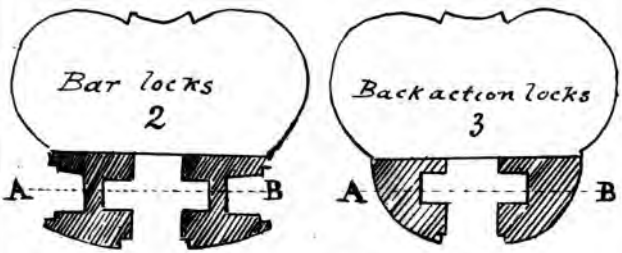
5th. From the same to the toe of the butt, *h* to *g*.

Pl.IV.



Double grip lever under guard, back action locks

1



Shaded portion shows solid metal.

Meade's Spherical

Dougal's

a Forsyth's

b

a unswedged

b swedged

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TILDEN FOUNDATIONS.

These measurements give the length of the stock.

The following particulars should also be given to the gunmaker in ordering a gun or rifle:—

For a gun or rifle, state the *calibre*, *weight*, *length of barrels*, and their *material*, *length and bend of stock*, *style of action*, and *locks*, whether *ordinary*, *rebounding*, or *hammerless*, &c., the quality, and price which can be afforded.

For a gun, whether *choke-bored* or *plain* in one or both barrels, and the approximate pattern required to be made by each barrel in a 30-inch circle at 40 yards, whether to shoot the *ordinary* or *extra long* cartridge, and whether to be regulated for firing ball, and any other particulars.

For a rifle ; the kind of cartridge it should be chambered for, the bullet and powder charge, style of sighting, whether the locks are to have safety-bolts or not, whether a pistol-grip is wanted, and any other little details which may appear necessary. Messrs. Tolley furnish intending purchasers with a form which can be filled up, in which these points are suggested; it is most convenient.

For India, and I suppose for most other places, all cartridge-cases, wads, caps, and all appurtenances of fire-arms should be procured and taken out from home; powder is best bought in India, as there is trouble in taking it out on board ship. Loaded cartridges also cause delay in shipping.

In ordering cartridge-cases, great care is necessary to give the correct size and designation, there being so many. I remember, as a case in point, a young fellow bringing a ·500 express rifle to India, chambered for the bottled-shaped cartridge, while the ammunition with which he was provided was the straight coiled case. He did not find it out till he tried his rifle at a mark, when the escape of gas very soon let him know that there was something wrong.

There is an import duty on fire-arms and appurtenances in India, of ten per cent. *ad valorem* on articles of this kind imported by military officers, and others entitled to possess them, for their own private use, a certificate to this effect being furnished by them. There is an import duty on gunpowder also.

Besides the usual case and fittings, spare

strikers, main-springs, fore-sights, nipples, &c. to replace those damaged or lost, should be taken. A cramp or vice for the main-spring should not be forgotten. A water-proof cover is necessary for each gun, one of thick durable material is the best. Leather gun-covers are a mistake for damp weather, they attract moisture and cause rust to form in the gun instead of protecting it. All gun-covers should be fitted with slings. For travelling and camp use, when one does not want to be encumbered with gun-cases, the guns may be carried in the covers. An outer cover of thickly-wadded cloth or blanketing put over the water-proof cover will protect the gun from being bruised or damaged; it should be made somewhat similar in shape to the waterproof cover.

I have not mentioned hammerless actions for double guns or rifles; if a high price can be afforded they can, no doubt, be had really good and reliable; but though I have had no experience of hammerless guns, I would not, as a rule, advocate their use in a country like India, or for any other part of the world where experienced gunsmiths are not usually within call, and would

certainly not recommend any of the cheap varieties of this action which have detached bar-locks. Of course, hammerless guns are not liable to accidents from the catching of the hammers against one's clothes, twigs, &c. and are quicker to use; but they are more complicated, their mechanism having to perform so much more work than that of ordinary guns, and if they get out of order are not so easily repaired by gunsmiths, who, although very good at work to which they are accustomed, may not understand these new actions, of which there are about twenty varieties in use.

At Calcutta there are two excellent gunmaker's establishments where repairs can be done, Manton & Co., and Rodda & Co.; and at up-country stations regimental armourers can usually do any petty repairs. In the Punjab, and at some stations elsewhere, native gunsmiths turn out excellent work, and can do repairs and copy from patterns very well.

A ·500 express bullet-mould, made a few years ago by a native at Rawalpindi, cast a bullet of the exact weight, to a grain or two, of the one given to him for a pattern, and this bullet made

excellent shooting. Bullet-moulds, implements, &c. can be turned out marvellously well by the Punjabee gunsmiths; and I even saw a pin-fire gun, which was too weak in the action to convert into a central fire, fitted with a new central-fire breech action, which was beautifully made and finished, and worked perfectly well. It was cut with a cold chisel out of a solid block of iron, and the smith's only implements were cold chisels and files and hand-drills; he had no machinery of any kind. The price charged for the new action was only £3.

Of course, in employing a native to do any work, it is necessary to make him thoroughly understand what is required of him—not always an easy matter. It is best only to employ him in copying a pattern, and caution should be used not to give the work to one who has not been ascertained to be a first-rate workman, especially in cases where bad workmanship would damage beyond repair a valuable article.

CHAPTER XII.

Difficulty of Shooting under a Bright Sun on account of the Glare; how Remedied.—The Flashing of Polished Barrels scaring Game.—A Cure for this Defect.—Neutral-tinted Spectacles.—Equipment, Clothing, &c.—Payment of Beaters or Coolies in India.—Hints on Beverages.—Works on Indian Sport recommended for Perusal.—The Prices of Guns and Rifles.—Conclusion.

In shooting in the open in bright sunlight, such as there usually is in India and other hot countries, great difficulty will be experienced in aiming on account of the glare of the sun. The top of the rib and other parts of the rifle that come near the line of sight should be roughed so as not to reflect the sunlight, and it will be found to be a good plan to have a couple of movable shades made to cover both the front and back sights for shooting under a bright sun. These shades might

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Pl. VI.

1

Foresight shade & protector

2

Backsight shade & protector.

3 Diagram for measurement of a gun.

b comb of butt.
c heel " "
g toe " "

1 a to b } for bend of stock
2 c " d }
3 h, centre of right trigger, to f } for length of stock
4 " " " " " e
5 " " " " " g

be made of steel, similar to that of which pen-holders are made, but a little stouter, to slip or slide on to the barrels. They would act also as protectors to the sights (see Figs. 2 and 3, Plate VI.). The sights as seen under these shades will be very clearly defined against an object. Messrs. Tolley supply protectors somewhat similar to those figured in Plate VI.

The polished barrels of guns and rifles are apt to scare game on account of the sun flashing on them, and, perhaps, the following plan might be of use to deaden their surface and prevent their flashing in the sun: give the barrels a coat of some dark oil paint, and sprinkle on it, while wet, some dust of a dark colour. In putting on the paint care should be taken not to touch any of the wood-work, the rib, sights, or anything from which the paint is not easily removable. It can be removed, when not required, with turpentine.

Neutral-tinted spectacles will be sometimes of great advantage in relieving the eyes from the glare of the sun; they do not, at least such is my experience, interfere with shooting in the least.

I will now say a few words about personal equipment, clothing, &c.

As in India cartridges are carried for one, it is not necessary to encumber oneself with belts or bags, but a few cartridges should be taken in the pocket; in big-game shooting this should always be done.

Cartridge-bags should be of large size, and should have two or three compartments for carrying cartridges of different kinds; this is useful when shooting with two or three different sizes of shot. Good leather shikar bag can be got at Cawnpore and other places in India. A piece of string, oil-rag, knife, &c. should be stowed away in a small pocket of the bag.

Rifle-cartridges, especially coiled ones, should be made up in packets of eight or ten, to prevent them being damaged by knocking about loose in a bag.

For a hunting-knife, a butcher's knife with a six-inch blade in a sheath is an efficient one. A few spare ones can be taken, they are cheap and come in useful. Mahomedans will not eat the flesh of animals which have not been "hallaled," or had their throats cut with cer-

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tain rites by one of their own sect; and it is as well to have one of these knives to give to one's Mahomedan attendant when one is out shooting. A few skinning-knives are useful to have.

Any amount of arsenic can be procured in the Indian bazaars for preserving skins, the art of doing which should be learnt from an experienced person.

A good shooting-coat for India, and probably most other semi-tropical countries, is one of Norfolk jacket cut, with stand-up collar and plenty of pockets. It should have leather strapped on the shoulders for convenience in carrying guns. The coat should be of some neutral-coloured material, dead-leaf colour, brownish grey, &c., according to the nature of the country and surroundings generally. The thickness and strength of the stuff should be suited to the climate and wear and tear it is likely to get. The coat should, for hot weather shooting, have a removable wadded lining to button on, to cover the spine, neck, and shoulders, which require protection from the sun.

The helmet, or "sola topee" (pith hat), should be covered with the same coloured cloth as that of the coat. Its cover may be wadded with cotton, and a wadded curtain to protect the back of the head, neck, and ears, may be buttoned on to it.

The trousers may be of the breeches or knickerbocker type, and should, for a country where spear-grass abounds, be of some close, spear-grass-proof material.

Gaiters of leather or tanned canvas, or "putties" (bandages of a kind of native serge), may be worn when necessary. Under-clothing, of course, can be worn according to climate, but flannel is best for India.

For snipe and quail shooting, &c., near a station, any old clothes do well enough, but for big game and most other kinds of sport an appropriate costume is necessary. The importance of colour in dress, especially in big-game shooting, is very great. No one dressed in white or other staring colour, or showing any conspicuous object about his person, like a white handkerchief, for instance, has a chance of being successful.

In India strong cotton material of all the good shikar colours may be had at most of the jails. It is very durable, and some of it which is something like canvas is proof against spear-grass. Clothing need not be purchased at home for shikar purposes; it can be as well and more cheaply procured in India.

For hot weather, the best boots to wear are those made of sambur-skin; they can be made to any pattern in the bazars. For stalking, I have seen capital sambur-skin boots made with thick cloth soles; they are quite noiseless. Sambur leather is prepared deerskin, and is like strong, thick, soft buckskin, but it is of no use in wet weather. For cold and damp weather English shooting-boots are best.

In Cashmere, where the pine-clad hill-sides are slippery from being covered with the needles of the fir-trees, the native foot-gear, grass sandals (chuplis), should be worn; they make one very sure-footed. They are worn over socks of soft leather.

I have now arrived at a point at which I must give a few parting hints.

When beaters and coolies are engaged by the

day, their payment, which varies from 2 to 4 annas a day, should not be entrusted to a native servant or "shikari," as a large percentage of it is likely to remain in these gentlemen's hands. Every beater or coolie, on being engaged, should be given a token by which he can be recognised at the end of the day's work, or at payment time. Gun-wads marked with initials do very well for this purpose; and the sportsman should pay them himself, or see them paid in his presence. If he does not take this precaution he may possibly find himself unable to get them easily the next time he wants their services.

Native servants in India are accustomed to receive a small percentage or "dustoorie" out of all money paid by their master, and it is better in a case like this to give them some little extra allowance instead of it, to keep them in good humour.

In small-game shooting, such as quail, partridge, &c., all beating is usually done by natives, who are under the superintendence of a native shikari, who is in the temporary or permanent employ of the sportsman. A few natives are

employed for carrying guns, cartridge-bags, tiffin-basket, soda-water, &c.

Water for drinking is best carried in a kind of leather bottle or bag called a "chagul," which is slung by a strap over a man's shoulders. The leather, being porous, keeps the water cool. It has a silvered spout for convenience of pouring out the water into a glass, and holds two or three gallons. It can be got at Cawnpore and other places.

It is as well not to drink wine, beer, or spirits, while out shooting, at any rate till the cool of the evening. Cold tea, carried in bottles, lemon-sherbet, soda-water, &c., are far better; an orange is a capital allayer of thirst, and a few of them should be taken if possible.

I have not space in a little work like this to go into the details of equipment necessary for a sporting trip. The camp equipage and other necessary impediments vary according to the part of India and the season the shooting is to be done in, and the proper things to provide can only be learnt on the spot; but to those who are anxious to learn about Indian sport and its accessories generally I cannot do better than

recommend the perusal of works like the *Highlands of Central India*, by the late Captain Forsyth, Sanderson's *Thirteen Years among the Wild Beasts of India*, and the works of Gordon-Cumming and others, which are capital narratives of sport among the big game of India, and give a good idea of the country in which they are to be found.

The *Asian*, a sporting paper published at Calcutta, contains a good many accounts of shooting-trips and shikari stories, which are also to be met with in the *Field*, *Shooting Times*, &c.

Forsyth's work, *The Sporting Rifle and its Projectiles*, is a most interesting one from the fact that it was the cause of the present state of perfection of large-bore rifles. His ideas have been very little improved upon, though they were given to the world twenty years ago, and thoroughly described what a good sporting-rifle should be like.

The prices of guns and rifles vary among the different makers. Double rifles cost from 50 to 60 guineas in Henry's, Rigby's, or Dougal's best qualities, to about £25 to £30 for Tolley's or

Turner's make, which is about the lowest rate at which perhaps really good double rifles can be got. The price of single rifles varies in the same way from £25 to about £5, according to the quality and make.

In shot-guns, Bland makes a very good shooting gun of plain finish, though not, of course, of the style of higher-class guns, costing from 6 to 10 guineas; and other makers have guns suitable for rough use at similarly low prices, some of them, as, for instance, Tolley's emigrant's gun, a very nice-looking and better-finished weapon than Bland's. Reilly's, Turner's, and other good makers' cheap guns, are to be depended upon as serviceable weapons.

A very good battery for general shooting, consisting of a double-barrel ·450 or ·500 express rifle and a good 12-bore gun, both with cases and fittings, &c., can be supplied by either Messrs. Tolley or Turner, and landed in India for about £50 or a little over.

For countries where only deer, antelope, and small-game shooting is to be had, and no dangerous animals are to be met with, a battery consisting of a shot-gun and single rifle of

·450 or ·400 bore, would suffice, and could be procured for from £20 to £25.

And now, hoping that the perusal of these pages may not altogether be unprofitable to my readers, I take my leave of them.

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