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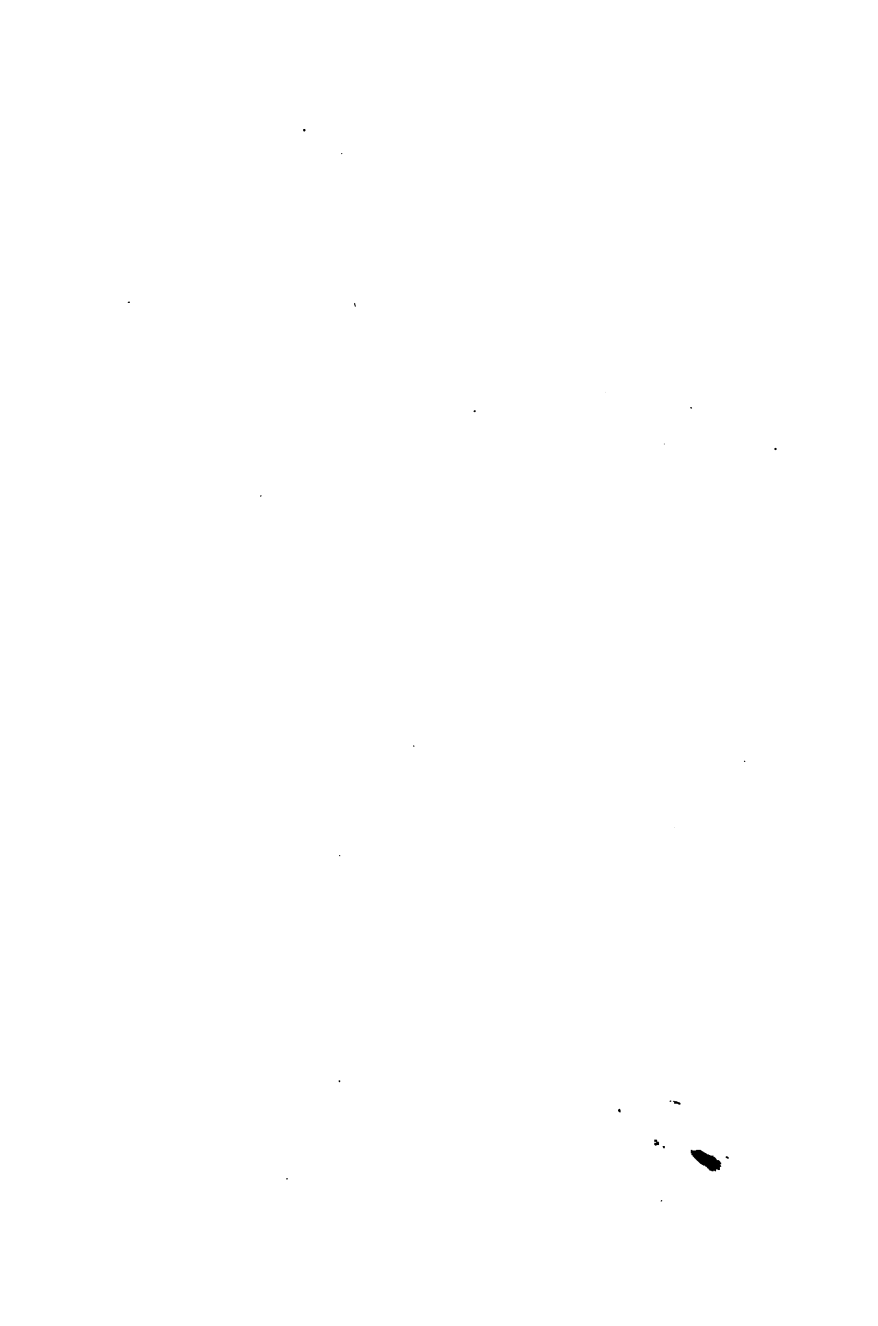
NOTES
ON
RIFLE-SHOOTING

CAPTAIN HEATON









RIFLE-SHOOTING.

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NOTES
ON
RIFLE-SHOOTING.

BY
CAPTAIN HEATON.

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DEDICATED, BY PERMISSION,
TO
LIEUTENANT-COLONEL
THE HON. ALGERNON EGERTON, M.P.
AND OFFICERS OF
THE 3RD MANCHESTER RIFLE VOLUNTEER CORPS,
TO WHOSE ENCOURAGEMENT AND LIBERALITY
THE AUTHOR'S
POSITION AS A RIFLE SHOT
IS MAINLY DUE.

PREFACE.

AT the request of numerous friends I have consented to publish my Notes on and experience in Rifle Shooting, not with the idea of instructing those of my brother riflemen who *may* know as much as, or even more of the art than I do; but for the benefit of Volunteers and others, whose time and means do not allow them sufficient opportunities to acquire by practice the knowledge so essential to success.

I have avoided the use of technicalities, and endeavoured to express myself in as plain terms as possible. I make no pretence to be scientific, but only very practical; and trust that this little work may prove beneficial to those it is intended to instruct.

In conclusion, I must ask my readers to be

lenient in their criticism on this my first appearance before the public in print, for I am bound to confess myself more *au fait* in the use of rifle than the pen.

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NOTES

ON

RIFLE-SHOOTING.



QUALIFICATIONS REQUISITE TO MAKE A GOOD SHOT.

THERE are persons who say that Rifle-shooting is a gift, and that a man, to become noted in the art, must be born a shot. I must be allowed, however, to say that I do not agree with them; for I believe that *any* man, with good health and sight, may by steady perseverance become the best shot in his company, corps, county—or ascend even higher than this. I could instance the career of many of our best shots in proof of my argument. An erroneous idea often prevails, that to become a good shot a man should spend half his days on a rifle-range; and for this reason we lose many men who, judging from their energy in other pursuits, would become famed in this most

useful of all pastimes. How often do we hear men say that they should like to become good shots, but that they have not time to practise ! I would answer to such, that they may become expert marksmen at their own homes. We are taught at Hythe that practice is only intended to find out what a man has learnt in drill. The first and greatest thing a rifleman has to learn is, to establish a connection between the hand and eye, so as to make his finger instantaneously obey his brain; and this may be done in any room, first with a snap cap, and afterwards with an ordinary percussion cap. When this difficulty is overcome, the young beginner will soon find that a little practice will make him a fair shot; and it is for such men as these that I have attempted this book, in the hope that my experience may counteract their want of practice, when perhaps business pursuits render it impossible for them to devote more than a few hours a-week to rifle-shooting.

If I were asked to draw the picture of a model rifleman, I should no doubt produce a fine broad-chested fellow, with a clear grey or blue eye; but pray don't let it be imagined that I consider these as requisites, for, as I have before said, I believe any one with good health and sight, no

matter what colour his eyes be, can make himself into a good shot.

There is one qualification, of far more consequence in my mind than the colour of the eye, namely, a perfectly easy temper. I consider it almost impossible for any man of an excitable temperament ever to achieve great success at a rifle contest. Colonel Hawker, one of the earliest and best authorities on field-shooting, makes the following remarks on this subject; they allude more particularly to game-shooting, but are equally applicable to a man when facing a target. He says—‘ One who vexes himself about missing a fair shot is the less likely to support himself at all times as a first-rate performer, because that vexation alone might be the very means of his missing other shots, and therefore he could not be so much depended on as another man who bore the disappointment with good humour.’ A bad shot at the commencement of a match should never cause a man to lose heart; he should rather console himself that a bad beginning and good ending is more satisfactory than suddenly to break down when the prize seemed within his grasp.

POSITION.

THE Positions of a Rifleman are as numerous as they are odd, each man adopting the one which best suits his fancy or the formation of his body. I would recommend the would-be Ross, Halford, or Martin Smith to try the various positions I will endeavour to describe, and to select the one in which he finds himself most at ease. Let him not be constantly changing, just because he sees some fortunate individual make a string of bull's-eyes in some other position than his own. How often have I seen men throw away all chance of a prize by changing their position during a match ; for, after making one or two bad shots in the new position, with which they are totally unacquainted, they are compelled to return in disgust to their old one. I will now describe the various positions I have seen used by our most eminent shots, and point out those I consider best suitable to a rifleman.

STANDING OR OFF-SHOULDER SHOOTING.

There are several ways of shooting standing. First, that taught at Hythe, in which you are ordered to place the left foot to the left front (when standing as a front-rank man), and keep the body perfectly upright; to hold the rifle firmly with the left hand, and lightly with the right. The left elbow, although not laid down in the book, is, I believe, supposed to be kept clear of the body.

Next we have the Swiss standing position, in which no particular manner of placing the feet is required. The whole body is kept perfectly rigid, the chest expanded as much as possible, against which the left elbow is allowed to rest, the rifle being held with the left hand, as near the trigger-guard as possible. The Swiss rifles have a kind of handle for this purpose. The upper part of the body is thrown back. Before firing, you may notice the Swiss marksman taking a long deep inspiration, which he holds until the bullet has left his rifle, when he gives a loud grunt of satisfaction if the shot has pleased him.

There is another position, used, I believe, by the Americans. The legs are kept rather wide apart, the body thrown forward, and the left arm,

which is perfectly straight, holds the rifle much nearer the muzzle than in either of the positions above named.

Of these three positions, I consider the modified 'Hythe' is decidedly the best, as the body is less constrained than in either of the others. For Non-Military shooting I would not confine a man to any particular way of placing his feet, leaving it optional for him to place them in such a position as will keep his body perfectly balanced. The knees should be braced up, so as not to allow the body to swing, and the arms kept in that position which allows the least leverage to play on the muscles.

We next come to those positions which may be used where 'any position' is allowed. It is useless for me to take up the time of my readers by describing the Hythe kneeling position, first, because every Volunteer is supposed to know it: and, secondly, because it is the last I would recommend to those who are not required to use it in the ranks; for although admirably adapted for military purposes, from the rapidity with which a soldier can load and fire, the position is dependent on the steadiness of too many parts of the body to make it a good one.

SITTING POSITIONS.

There are many modes of shooting sitting. In the one most commonly used, and that until very lately used by Colonel Halford, the firer seats himself on the ground, with his left leg advanced, and the right one almost at right angles to the left. The elbows are placed just inside the knees, and the body thrown a little forward. This position, which is a very good one, does not suit a man with a short back, unless he is able to persuade the officer in charge of the squad that he is afraid to take cold, and obtain permission to raise himself off the ground by means of a roll of coats, &c. Being raised a few inches from the ground makes the sitting position almost perfect.

Another sitting position is that used with great success by Lord Elcho. The knees are placed close together, and the feet kept wide apart, but opposite each other. The barrel of the rifle is allowed to rest between the knees, and is held firmly with the left hand outside the knees; the sling of the rifle being twisted round the left arm, which holds the rifle securely, and takes away much of the recoil. Well as Lord Elcho shoots in this position, I fear it is not one suited to many riflemen.

Sergeant Dougan used to make wonderful practice in a sitting position peculiar to himself. After seating himself on the ground, he placed his rifle on his left knee, which he raised about as high as his chin, and allowed his right leg to remain on the ground at about right angles to the left. With his left hand he grasped both his rifle and his left knee.

The only remaining sitting position that I remember is that used some two years ago by Mr. Dunlop. Instead of keeping his body square with the object he wished to shoot at, he seated himself on the ground facing to the right, raising both his knees as high as possible, and keeping his feet close together. His arms were folded round his knees, the left hand grasping the right wrist. The rifle rested in the bend of the left arm, the butt being placed against the muscle of the right arm, and the rifle being held by the right hand.

LYING POSITIONS.

Last of all we have the lying positions. I only know of two, the first of which is that which has helped to make Mr. Farquharson so famous. He lies on his back, or rather on his right side, crossing his left leg over his right, and rests his right elbow on the ground. The most remarkable

part of the whole performance is the manner in which Mr. Farquharson twists his left arm round his neck and holds the butt of his rifle, thus giving support to his head. The rifle is allowed to rest comfortably as it were along the body. For those who are able to adapt themselves to this position, it is doubtless a very good one, as none can be more steady; but I fear few men will find themselves as much at ease as Mr. Farquharson appears to be, indeed must be, from the excellent shooting he makes.

There is a kind of later edition of the 'Farquharson Position,' where the firer, instead of twisting his arm round his neck, holds the butt of his rifle with his left hand, and supports his neck by holding his coat-sleeve with his teeth.

The position I would strongly recommend all men to adopt is the one which, from experience, I have been led to select, namely, lying with my face towards the ground. The whole body is in a state of perfect rest; and in warfare this position is certainly a good one, as a stone will hide you from view, and often stop a mischievous bullet. There is only one thing against all lying positions, and that is, the nearer you are to the ground the greater is your aim influenced by mirage. In the position I am now

describing, the elbows support the chest and raise the head to a proper height to take aim ; the left elbow should be kept almost straight under the rifle (for, if allowed to go too much to the left, there is heavy strain on the wrist), whilst the other is placed a little to the right. It is a good plan to make two small holes with the heel of your boot, to prevent your elbows from slipping. Many men have tried this position and discarded it, because they got so much punished about the shoulders. This is entirely caused by keeping the legs too straight behind the body ; by curving them well away to the left the collarbone seems to disappear, and the recoil is received by the muscle on the shoulder, whereas if the rifle is placed against the bone, the punishment is so great that no amount of padding will prevent it.

I think I have now described all the positions which I have seen used at our rifle contests ; one point only remains for me to notice, namely, the proper manner of holding a rifle. It should be held firmly with the left hand, but care should be taken not to grasp it so tight as to cause any strain on the muscles, which would give a tremulous motion, and spoil the best possible aim. Many excellent shots simply allow the rifle to

lie flat on the hand, but I cannot recommend this plan. I like to feel that I have a perfect command over my rifle, and that I can make it obey my will and not its own.

I am not an advocate for holding the rifle tightly with the right hand, but I have found that the pull-off is much lightened by pressing the ball of the thumb against one side of the stock, and the fingers against the other. This manner of pressing the trigger will prevent the common error of pulling the muzzle off to the right. Great care should be taken that the butt of the rifle is pressed firmly into the hollow of the shoulder, and not against the muscle of the arm. If the recoil comes against the proper place, there will be no fear of a sore shoulder; once allow the arm to get tender, and it is good-bye to shooting for many a day.

Nothing is more important than keeping the sights perfectly upright, as the slightest inclination to either side will materially alter both direction and elevation.

DRESS, TRAINING, ETC.

No doubt some will exclaim, on reading the heading to this chapter, 'What in the world will the man write about next? as if dress has anything to do with shooting.' It really has more to do with a man shooting well than some are aware. Colonel Hawker, the greatest authority on field-shooting, considers the dress of a shooter a matter of importance, and lays great stress on comfort being considered rather than appearance. It is not my intention to advise the young beginner to go to any particular tailor and order some peculiar style of coat, but rather to give him a few hints on this subject that may prove useful.

In the first place, never go to a rifle contest in a dress that is likely to make you conspicuous; for, if you are at all sensitive, you may hear remarks that will perhaps rob you of one or more bull's-eyes.

Of course, in Volunteer matches, you are required to appear in the uniform of the corps to

which you belong ; and fortunately most corps are now dressed in a sensible, workmanlike manner, and have not got an elaborate knot of braid, as some used to have, just where the butt of the rifle ought to be placed. I have seen volunteer officers, shooting in a rifle contest, carefully ' got up ' in shako, sword—in fact, wearing everything that was unnecessary. It is for the special advice of these gentlemen that these remarks are written.

I was at an All Comers' contest last year, and saw a worthy member of a Light Horse corps shooting in full uniform, not forgetting his spurs. The idea struck me, that, if he had chosen to lie on his back, his spurs might have been useful to hold on by, but when I saw him shooting in my favourite position, with his spurs well up in the air, I certainly did not see their great use. The amount of chaff that my worthy friend had to put up with could hardly be said to have improved his shooting.

I would not have a man attend a contest as if dressed for a fête or wedding breakfast ; but rather choose to appear in some loose elastic garments that he is not afraid to spoil either by getting wet through or by being obliged to lie down in without one of the many appliances of

'Punch's' Small-bore Man. To prove that I practise what I preach, my readers will excuse me if I relate a little circumstance that occurred to me last year at one of the great meetings. I happened to be shooting pretty well, and the fact of my being almost certain to win, caused a fair lady to ask, 'Which is Captain Heaton?' My feelings may be easily imagined when I next heard her exclaim, 'What! that shabby-looking man!' I certainly wore an old coat, but one which from its ease I did not wish to discard.

I have a great idea of a man keeping himself warm whilst shooting, and would always recommend strong waterproof boots, with a long Mackintosh coat, which makes the state of the weather a matter of little moment. The collar should be perfectly loose, so as to allow of the head being thrown back without restraint. I have often noticed that when the Father of modern Riflemen, Captain H. Ross, really means mischief, he takes off his collar, and unbuttons the neck of his shirt. A rifleman's study on the subject of dress should be to aim at comfort even at the cost of appearance.

In making a few remarks under the head of Training, &c. I wish to be distinctly understood that I do not for one moment attempt to lay

down any rule which can apply to all, for what is one man's food is truly said to be another man's poison. I am not an advocate for a moderate man placing himself under any strict system of physical training or dietary. Mental training is quite another matter. By physical training I allude to the constant and excessive use of dumb-bells, &c. simply for the purpose of strengthening the arms. I don't mean to say anything against this, but that it is quite unnecessary. I would rather have a man continue to live in his accustomed manner, taking, of course, sufficient exercise to keep himself in perfect health; for all he requires is a steady hand, a clear eye, and enough constitutional strength to carry him through the excitement of a long day's shooting, such as the International Match.

I feel sure it is a mistake for a man accustomed to take his few glasses of sherry or claret, or glass of bitter beer at dinner, suddenly to abstain from these, under the impression that by so doing he will improve his shooting in some particular match. I have known many good shots suffer from this, and the remark applies with force to my own case: for during the Wimbledon meeting of 1862, I was most careful to avoid all forbidden fruits, as I imagined then, such as pastry, wine,

ale, &c. ; and the consequence was, that I was in a perfect state of misery lest I should take anything that would spoil my shooting. With all this care, I never won a prize. Last year I lived like a sensible man, and not only had better health, but was much more fortunate than at the former meeting.

All that a rifleman has to avoid is anything like excess. I certainly should not choose to shoot a match the day after I had done justice to a friend's fine old port. I have nothing to say in favour of smoking, as in many cases tobacco affects both steadiness of hand and clearness of sight.

DESCRIPTION OF THE VARIOUS RIFLES AT PRESENT IN USE.

MY chief reason in devoting a chapter to the description of rifles now in use, is to benefit those who have not yet possessed themselves of a Small-bore, but who hope or intend to do so. Most riflemen have their own ideas as to which is the right principle in constructing a rifle; I, therefore, by giving an accurate description of each maker's mode of rifling, &c., together with the peculiar merit of the gun, enable my readers to judge for themselves. In order to render this chapter of practical use, I applied to the different makers for a descriptive outline of the rifles made by them, which I give as nearly as possible in their own words. Taking them in alphabetical order, I shall begin with

THE BAKER RIFLE.

I am able to give but a slight description of this rifle; those made for the Small-bore Com-

petition of the National Rifle Association at Woolwich were, .451 bore, one turn in 30 inches, weight $9\frac{1}{2}$ lbs., stocked military fashion, and rifled with ten grooves. It was the inventor's intention to have shot with hardened mechanical projectiles, but he was prevented doing so, and partly attributes his defeat to the use of soft leaden bullets, and a badly fitting slide for his rest. Mr. Baker intends to be fully prepared for some future contest, when he expects his rifle will meet with better success.

THE BEASLEY RIFLE,

which is virtually a Whitworth, is thus described by Mr. Beasley :—‘ The rifle which I have manufactured and sold most of, is made by virtue of a licence I procured from Mr. Whitworth, and does not differ in any respect from his. When first the Whitworth rifle came before the public some seven or eight years ago, I saw an account of it in the “ Times,” was struck with what I thought its originality, and made one, only from the description I saw in the “ Times,” and I was really surprised with its results. Rifle-shooting was then in its infancy ; and although I had had considerable experience in making double and single rifles for game

shooting, I was not prepared for nor did I anticipate such results. I formerly used naked bullets, cast in a mould the same size as the barrel; in fact, made from a piece of it. But I sometimes found a difficulty in loading from the barrel becoming leaded; it struck me that the rifle would shoot well with a cylindrical bullet, and a greased felt wad. I made bullets, pressed in a die of the same bore as the barrel, .451; but I had no hollow at the base, and they were not wrapped in paper—and I am not quite sure now if this is not the proper way to use the cylindrical bullet. I made a great number of experiments, but I had the misfortune to lose my papers, and can only draw such conclusions as my memory will furnish me with. However, the result was, I procured a licence from Mr. Whitworth, and taking for granted that his great facilities for carrying out experiments enabled him to arrive at great conclusions, I followed in his steps, and made no more experiments, but used his ammunition, &c. Of course my object was a pure matter of business. I found people would not come to me unless I offered an inducement; and I thought it would be no bad idea to make a Whitworth rifle, that with respect to price would come within the reach of any one who could

devote any time at all to rifle shooting. I then manufactured a rifle at £10, complete with wind gauge; and to show what could be done with a cheap rifle, I trained for and shot with one in the "International Match." I feel that I have nothing more to say than that my rifle is a Whitworth-bore, .451, rifled hexagonally with a spiral of one turn in 20 inches, shooting mechanically fitting or cylindrical bullets, with greased wad as lubrication.

'Price at which I supply the rifles is from £10 10s. to £31 10s. The barrels of every rifle are made of the same material and rifled exactly in the same way, and manufactured with equal care.

'The principle upon which I rifle is, I think, equal to any and superior to most systems at present in use. I do not scrape or shave small shavings at a cut, but I cut the whole groove the proper depth at *one cut*. The tool is made exactly the shape of the groove, so that it has only to pass once through the barrel to form one groove. I contend that one clear cut will be more accurate than a succession of cuts, and by this method you can ensure having all barrels alike.'

Mr. Beasley has since made another rifle, and thus describes it: 'I have made another rifle,

which is certainly the best I ever used for soft lead, and with it I have made the best figure I ever saw made with any rifle firing a soft leaden projectile, the only objection is the uncertainty about fouling.' The description of the rifle is as follows:—

Bore.—·451.

Grooves.—0·10 deep; 10 in number.

Lands.—0·20.

Spiral.—1 turn in 20 inches.

Projectile.—530 grains, cylindrical.

Powder.—85 grains, Curtis and Harvey's No. 6.

Lubrication.—Greased bullet, 4-5ths grease, 1-5th wax.

Price, from £10 10s. to £31 10s.

'The lands are very narrow, and allow the bullet to expand easily, and the shape it leaves the muzzle is like a ball of larger bore, with grooves cut down it.'

THE BISSEL RIFLE.

This rifle also competed at the National Rifle Association Trial. The following is the maker's description of it:—

Diameter of Bore.—·451.

Grooving.—5 cuts; arcs of circles of about half the diameter of the bore.

Width of Grooves.—Once and a half that of lands, or lands two-thirds the width of grooves.

Depth of Grooves.—Uniform, $\cdot 015$ of an inch.

Spiral.—1 turn in 20 inches.

Projectile.—Weight 530 grains, whether mechanically fitting or not, either sort wrapped in paper.

Charge of Powder.—85 grains. Curtis and Harvey's or Lawrence's No. 6.

Lubrication.—Patch 2 parts tallow, 1 wax.

‘The peculiar excellence of the rifle is due to the mechanical perfection of the bore, to which strict attention is paid. The form of grooves enables the mechanically fitting projectile to be used.’ Mr. Bissel thus ends his description:—

‘The rifle does not foul, cleans easily, shoots well, and wears well.’

Price of rifle, full stocked, with wind-gauge, fore sight, from £8; drilled steel barrel, half stocked, made up in sporting style, aperture sights, &c., up to £35.

THE CROCKART RIFLE

is thought very highly of by those who fire with it, and used with great success by the maker, who has favoured me with the following description:—

Diameter of Bore.—·442 to ·448. Very much like a pentagon, with the corners or angles well rounded off.

Grooves.—Five in number, elliptical, occupying almost all the inner surface, leaving only very narrow lands; they are a 40th of an inch deep in the centre.

Spiral.—One turn in 22 inches.

Projectile.—530 grains in weight, cylindrical, hollow base, or mechanically fitting bullets, made of soft lead.

Charge of Powder.—80 grains of Curtis and Harvey's No. 6.

Lubrication.—A compound of grease, wax, and soap, formed into a stalk and rubbed on the bullet; a card wadding, lubricated with same mixture, is also used.

‘ The peculiar excellence of the Crockart rifle consists in the peculiarity of the grooving, which the maker asserts will entirely prevent the bullet from stripping, as the grooves terminate into one another, leaving very little of the surface of the original bore as lands, and thus, from their form, they allow the expanding bullet to fill up every part of the grooving, preventing fouling and the escape of gas. The rifle has no acute angles, to induce tearing of the bullet, when passing through

the barrel is missing it at present a rough sur-
rounding atmosphere as it spins in its flight.
Crompton strongly advocates an odd number
grooves, and considers five better than either
three or seven.

Price.—This rifle is supplied at all prices, from
£20 to £50, the former being made of the best
possible materials, the latter of Government iron,
and fitted as an Enfield, but with a moveable
fore sight.

THE EDGE RIFLE.

I have been favoured by Mr. Edge with the
following:—“This rifle approaches nearer to a
circle than any other. The cuts, or grooves, are
of that peculiar yet simple form, that they not
only give certain rotatory motion to the bullet,
but are very durable, and are easy to clean. The
rifle is constructed with nine grooves, each open-
ing outwards towards the bore, at an angle of 45
degrees, and leaving the bore $\cdot 05$ of an inch wide,
and each land the same, the cut being $\cdot 04$ of an
inch deep, uniformly from breech to muzzle; the
spiral varying from one turn in 15 to 30 inches,
according to the use for which the rifle is in-
tended.

Diameter of the Bore of match rifle is $\cdot 451$ of
an inch; that of the sporting rifle much larger.

The *Projectile* is conoidal, about $3\frac{1}{2}$ diameters in length, with a hollow base, and may be either round or rifled, so as to fit the barrel. The peculiar construction of this rifle does not require a mechanically fitting projectile to bring out its true merits.

The *Weight of the Bullet* used is 530 grains.

Charge of Powder, 85 grains of Curtis and Harvey's, or Lawrence's No. 5.

Lubrication.—A grease wad, composed of 5 parts Russian tallow, and 1 of wax.

The barrels of the match rifle are 36 inches long—those of the sporting guns various—and about $7\frac{1}{2}$ lbs. in weight; and are made up with the best materials and workmanship.

Price £30.

In describing the *peculiar excellence* of his rifle, Mr. Edge thus concludes his remarks:—
‘ The simplicity of this rifle is one of its many recommendations, and the numerous prizes it has won since it was patented in 1860 prove its excellence.

‘ Unlike most rifles, the bore is nearly circular, and this is considered by the scientific to be another of its advantages; and yet its certain action on the bullet, never failing to give the proper rotatory motion, without liability to foul,

is one of the great secrets of the rifle's excellence. It shoots pleasantly, and with little or no recoil.

THE HENRY RIFLE.

At the request of the maker of this celebrated weapon, I publish the description given of it in Blanch's *Book of Facts* :—

‘ At the latter end of 1860, a short paragraph went the round of the papers to the effect that a new rifle had been patented by an Edinburgh gun-maker. It was further stated that the inventor had, in a recent trial of his rifle, scored as many as eight points (old scoring) out of six shots at 1,100 yards, the first shot being a miss, and the remaining five being made up of three centres and two outers. To say that this statement *then* took the whole rifle world—makers and marksmen—by surprise, would give but a faint idea of the effect produced. It was deemed incredible, and many refused to believe that any but a Whitworth could produce such results. However, it soon transpired that the rifle in question was none other than the “ Henry,” which was destined, ere nine months had elapsed, to win for itself a name second to none for correct scientific principles embodied in its construction, and for the extent and wonderful accuracy of its range.’

The first time on which the 'Henry' was brought into open competition with the 'Whitworth,' and other Small-bore rifles, was on February 19, 1861, at the annual competitive trial held by the National Rifle Association at Hythe, to determine the best weapon which should be employed to compete for the second stage of the Queen's prize. By the rules of the Association competitors were allowed to bring their own rests; and as Mr. Henry had not availed himself of this privilege, he would have been compelled, in the event of competing, to make use of the mechanical rest provided by the Association, the slides of which did not suit Mr. Henry's rifle. As Mr. Whitworth was fully prepared with one of his beautiful rests, Mr. Henry did not feel justified in allowing his rifle to compete; consequently it was a 'walk-over' for the Whitworth.

The next time the 'Henry' put in an appearance was at Wimbledon, where it successfully held its own against all comers. The stocking and sights of Mr. Henry's rifle were so superior to any other at that meeting, that it soon established itself as a favourite weapon with all good shots.

'The form of rifling adopted by Mr. Henry consists of a number of planes (generally seven),

with a corresponding number of lands or , extending inwards, the apices of the latter concentric with the centre of the surfaces of contiguous planes. It will thus be seen that projectile has fourteen bearing surfaces, w^h tend to give it a steady, uniform, motion as passes up the barrel.'

The following is the descriptive outline of th rifle:—

Bore.—·451.

Grooves.—Plain, with 4 to 12 bead angles, generally 7.

Spiral.—One turn in 30 inches.

Projectile.—530 grains, cylindro-conoidal, or mechanically fitting.

Charge.—86 grains Curtis and Harvey's No. 6.

Lubrication.—Greased wad.

Price.—From £10 upwards.

THE 'LONDON ARMOURY OR KERR RIFLE,' with which most excellent practice is made, is thus described by Mr. Kerr, the Superintendent of the London Armoury Company:—

Diameter of Bore.—·451 of an inch, shape circular.

Grooving.—Six grooves, Ratchett form, without angles; and as the deep part of the groove is on

the side from which the bullet turns, the resistance to the air is reduced to a minimum: the other side of the groove verges into the cylinder bore, thus leaving lands which are mechanically true.

Spiral.—At the breech end the grooves are nearly straight, increasing in twist until, at the middle of the barrel, they attain the full spiral of one turn in 20 inches, which is thenceforward maintained at the same pitch to the muzzle.

Weight of Barrel.—About 5 lbs. 4 oz.

Weight and Shape of Projectile.—The ordinary cylindro-conoidal bullet, weight 530 grains, diameter .442 of an inch.

Charge.— $2\frac{3}{4}$ or 3 drachms of No. 6 Small-bore rifle powder.

Lubrication.—Solid grease or lubricated wad, as made by Eley Brothers.

Price at which the Rifle is supplied.—From £5 16s. 6d. ; but Mr. Kerr strongly recommends the rifle at £6 10s., which is complete, with steel furniture, small grip, light detanted lock and chequered hand and fore end.

Mr. Kerr claims the following as *the peculiar excellences of his rifle*: ‘The straight part of the grooving allows of perfect expansion of the bullet, thus avoiding windage and consequent

fouling; stripping, of course, is also prevented. A great advantage connected with this rifle arises from the system of manufacture, as the lock and all other parts and limbs are interchangeable with the Long Enfield rifle, thus rendering the repair of any accident a mere matter of writing for a duplicate part; and whenever a purchaser, whether at home or abroad, is within reach of a garrison town, the armourer is always competent to supply any defect.'

THE LANCASTER RIFLE.

I have been obliged by Mr. Lancaster with the following description of his rifle:—

Diameter and Shape of Bore.—Diameter suitable to the purpose intended, whether for military or other purposes. Shape of bore, oval.

No grooves; oval, $\cdot 015$ of an inch.

Spiral.—Proportioned to the diameter and length of projectile.

Weight and Shape of Projectile.—Strictly in proportion to the diameter of the bore, or usually three diameters. No precise description can be given without knowing the service for which the rifle is intended.

Charge.—The maximum that can be employed.

Mode of Lubricating.—Wax wadding.

The peculiar excellence of the rifle consists in the absence of all angles and grooves. The minimum exertion of power to upset the column of lead constituting the bullet in the form of the rifling, therefore a less proportion of failure to take the rifle motion, and the peculiar facility in cleaning the arm.

The prices at which the Lancaster Rifles are supplied are as follows :—

Government arms at Government price; Small-bore arms at 10·15 to 40 guineas.

THE NEWTON RIFLE,

made by the Inventor of the ‘ Venetian Screen Sight,’ is thus described :—

Diameter of Bore.—·451 of an inch.

Grooves.—7 in number, with angles rounded, and lands same width.

Spiral.—One turn in 20 inches.

Projectile.—Plain cylindrical, weight 530 grains.

Charge.—85 grains of Curtis and Harvey’s No. 5.

Mode of Lubrication.—Grease wad in rear of projectile.

Mr. Newton asserts that the *peculiar excellence* of his rifle consists in freedom from fouling, com-

bined with accuracy in shooting. The rifles are supplied at the following prices :

Military pattern, £10 10s.

Pistol hand, patent back and front sight, £22.

THE PARSONS' RIFLE.

This rifle is one of those which competed at the National Rifle Association's Small-bore trials. The following are the peculiarities of its make, kindly furnished by Mr. Parsons:—

‘The *Diameter of Bore* of the rifles I have supplied is $\cdot 451$ of an inch, but my only reason for adopting this size is, that it is the one prescribed by the rules of the National Rifle Association, and I think it would be better if the Association were to allow a little more latitude in this respect, by simply fixing the weight of the rifle and weight of projectile, and leaving it to the maker to produce what he thinks fit. I am now making some experiments with rifles of smaller bore than $\cdot 451$ of an inch, and have obtained some good results with them, namely, a lower trajectory and diminished recoil.’ Providing me with a diagram, Mr. Parsons says: ‘The section of the grooves is described by arcs of circles, the centres of which are placed in a circle (which I term the generating circle) struck

from the centre of the bore, at equidistant points around it, and so that a straight line drawn from a point in each arc, equidistant or nearly equidistant from its two extremities, will be at right angles, or nearly at right angles, to a line drawn from that centre to the centre of the bore.

Number, width, and depth of Grooves.—Any number of grooves may be used, but I generally employ nine. The width and depth of the grooves are also immaterial; but the important thing is, the angle the side of the groove makes with the surface of the bore, which should be well without the angle of friction, or about 1 in 5.

Spiral.—One turn in 20 inches for .451 inch bore.

Weight and Shape of Projectile.—The best shooting has been made with hardened mechanically fitting bullets, fitting mechanically about one-third of their length, the remainder being cylindrical; weight 530 grains.

Charge.—85 grains of Curtis and Harvey's No. 5, or Lawrence's No. 4.

Lubrication.—By means of a lubricating patch.

The peculiar excellence of the rifle consists in the form given to the grooves, which, whilst allowing a loosely fitting projectile to be used, will always ensure a large bearing surface, to act

on and impart to it the rotatory motion, by which friction is diminished, and will always cause it to be truly centred with the bore of the gun. This rifle has a particularly low trajectory, the elevation at 1,000 yards being $2^{\circ} 38'$.

Price at which the rifle is supplied, is from 10 to 30 guineas, according to materials and workmanship.

THE RIGBY RIFLE.

Mr. Rigby has kindly furnished me with the following description of his rifle, which made such a favourable impression on the minds of all riflemen, by its extraordinary performances at the late Small-bore trials at Woolwich. Mr. Rigby was rather unfortunate at 500 yards, mainly owing, I believe, to his rest being too light; but his diagrams at 1,000 yards are quite sufficient to prove that the rifle possessed more than ordinary merit.

Diameter of Bore.—Smallest diameter, $\cdot 451$; largest diameter, $\cdot 480$. One-half of the original surface is untouched in rifling. Shape of bore, octagonal.

Spiral.—One turn in 18 inches.

Weight, &c. of Projectile.—Mechanically fitting, made of hardened lead. Weight, 530 grains; length, 1.42. The hollow in rear of the bullet is filled with plaster of Paris, which remains in its place during the flight of the bullet, and

prevents the paper, lubrication, &c. from being lodged in the cavity. This forms Mr. Rigby's patent.

Charge.—86 grains Curtis and Harvey's No. 6, at all distances.

Lubrication.—An octagonal tallow wad, lightly tempered with wax.

The excellence of the rifle consists in the friction between the bullet and barrel during its exit being so reduced that a very low trajectory is obtained without increasing the recoil. At the late trial at Woolwich, the last diagram made by Mr. Rigby's rifle at 1,000 yards was shot with an elevation of $2^{\circ} 44'$, which, corrected for the height of the point of mean impact, gives $2^{\circ} 27'$ as the actual elevation, which is wonderfully low. This plan of rifling is very durable, as one-half of the original surface remains untouched in rifling, and presents great resistance to abrasion in cleaning or to accidental injuries. It is also very good for expanding bullets, as the grooves are easily filled, and, from their shape, have a most efficient grip, which renders stripping impossible, while the resistance of the air to the rotation of the bullet is reduced by being received on inclined surfaces.

Mr. Rigby supplies his rifles at the following prices:—Best match rifle, 36-inch steel barrel, with

Vernier back sight and improved wind-gauge sight, 22 guineas. Plain rifle, straight hand barrel and sight as above, 17 guineas. Apertur sights, 3 guineas extra. Plain military pattern rifle, heavy steel barrel, wind-gauge fore sight, 10 guineas.

All the above are tested at the range and mean elevation marked on sights to 1,000 yards.

Mr. Rigby's patent mechanical projectiles are supplied at 6s. per hundred.

THE TURNER RIFLE.

Diameter of Bore.—·452.

Number of Grooves.—Five.

Width of groove at bottom, ·175; at top, ·190, at the nose end of the barrel; width of groove at the breech, bottom, ·175; top, ·225.

Depth of groove at Breech.—From ·020 to ·026; this depth diminishes on a curved line for about twenty inches of the barrel, to ·006, and continues this depth to the nose.

Spiral.—One turn in 20 inches.

Projectile.—Made of soft lead. Weight, 530 grains; shape, cylindro-conoidal, ·441 diameter.

Charge of powder to be used with greased bullets is 70 grains, of Lawrence and Sons' No. 4, or 85 grains of same powder may be used with bullets not greased, and a grease wad.

Mr. Turner, by his patent, claims the right of any number of grooves, and the right of adapting the rifling to any bore.

The peculiar excellence of the rifle consists in its not fouling — 2,500 rounds having been fired out of one barrel by Dr. Goodwin during a period of some months, without once wiping out, and without affecting the accuracy of the shooting.

THE WHITWORTH RIFLE.

This wonderful weapon requires but few words of praise, its performance being too fresh on the minds of all riflemen. Mr. Whitworth, as most of my readers are doubtless aware, was the first to inaugurate the present competition in the manufacture of Small-bore rifles, and to his great scientific attainments we owe much of the perfection to which rifle-shooting has been brought. Mr. Whitworth has long been celebrated for his machinery ; and by applying his extensive knowledge in its use to the manufacture of modern fire-arms, he has been enabled successfully to hold his own against all comers.

Mr. Leece has kindly favoured me with the following particulars :—

Rifled hexagonally, size '45 in. across the flats, and '49 across the rounded angles.

Spiral.—One turn in 20 inches.

Projectile.—Mechanically fitting, made of hardened lead.

Lubrication.—Grease and wax wad ; the angles of the bullet also lubricated.

Charge.—Eighty-five grains Curtis and Harvey's No. 5.

The excellence of the rifle consists in having the barrel made of steel and rifled on the polygonal system, together with the uniform and accurate manufacture. The ammunition best adapted to the rifle has been carefully worked out by actual experiments, which of course also improves the shooting ; in fact, the excellence of the rifle is made up of the whole, viz. principle, accurate workmanship, ammunition, and accessories.

The price varies from £10 to £35.

BREECH-LOADING RIFLES—MONT STORM'S RIFLE.

Mr. Storm's system is applicable to any rifling or bore, as might be seen at the last Wimbledon contest ; but the rifles made by him for the Woolwich competition had a *spiral* of one turn in 30 inches ; *charge*, 77 grains of best powder ; *projectile*, 530 grains in weight, cylindrical, with greased paper.

The *peculiar excellence* of Mr. Storm's invention exists in the breech, and is thus described by him: 'Breech-loading arms may be divided into twelve different systems or "species," and there are at least eleven varieties of these species. The twelfth species (Mont Storm's self-sealing chamber system) is of comparatively recent development, and its plan is adapted so as to be universally applied to every style and class both of military and sporting arms, or the ready conversion of present muzzle-loading arms into breech-loaders. Some of its many points of merit may be enumerated as follows:—

'It has a chamber, but no lever, either lateral, vertical, or of any other description, to catch in the accoutrements, dress, or bridle-rein.

'It is confined to no special ammunition.

'The charge may be varied, but the arm cannot be overloaded.

'The explosion takes place within a solid chamber.

'The recoil is upon a solid breech.

'The connection between the stock and barrel is strong, graceful, and fixed; thus it is adapted for the use of the bayonet for infantry.

'It cannot stick fast, or dry by rust or powder dirt.

‘There is no sliding or abrasion of one surface upon another in opening and closing the breech, so there is no wear by friction.

‘In the insertion of the cartridge, the ball constitutes the handle or ramrod.

‘It cannot be fired accidentally or purposely till the chamber is locked in place, and the locking device is solid, self-acting, and infallible in its operations.’

THE WESTLEY RICHARDS RIFLE.

The following are the particulars of this celebrated rifle, which has performed with such great success at all the Wimbledon contests :—

Weight of TARGET RIFLE.—3 feet barrel, short stock, 10 lbs.

Diameter of Bore.— $\cdot 450$ of an inch.

Octagon Rifling.

Weight of Projectile.—530 grains.

Charge of Powder—85 grains.

Average Figure of Merit at 600 yards, about 9 inches; at 800 yards, about 15 inches.

Average Angle of Elevation at 1,000 Yards.— $1^{\circ} 50'$ to $2^{\circ} 0'$.

Weight of INFANTRY MUSKET.— $9\frac{1}{4}$ lbs. Bore and rifling same as Target rifle.

Weight of Projectile.—480 grains.

Charge of Powder.—75 grains.

Price from £11 11s. to £32.

Peculiar excellence claimed is the great advantage of breech-loading over muzzle-loading rifles.

AIMING, ETC.

It is a much easier task to describe all the various sights and pull them to pieces, than it is to make one really good one. In my humble opinion there is hardly a single *good* sight at present in use, excepting perhaps the aperture and Dr. Goodwin's sight. The great difficulty, in fact I may say impossibility, seems to devise any sight which places the eye, the sight, and the target in proper focus. To get rid of the haze or burr is the insuperable difficulty.

I think I cannot do better than give a rough outline of the sights which have come under my notice, and leave my readers to select the one that gives them the best results in practice.

The first in order is the ordinary Enfield sight, which has many defects. In the first place, the back sight is fixed much too near the eye for the firer to take a *clear* aim: if it were three to four inches nearer the muzzle, much of the burr which *now exists* would be done away with. If really

fine shooting be required, rifles ought to be made, as it were, in sizes; that is to say, with the back sight fixed at various distances from the muzzle: for it is as impossible to expect all men to agree where the sight ought to be placed, as it is to expect them to require the same focus when using a telescope. The V of the Enfield back sight is much too acute. I should prefer a flat bar; but if notch there must be, the angle might with advantage be more obtuse than at present.

I think all that can be said in favour of the Enfield fore sight is, that, as a military weapon, it is strong and not easily broken. The difficulty of distinguishing between full, half, and fine sight with sufficient accuracy, especially at long ranges, is too great to admit of anything more being said in its favour. All those who use an Enfield rifle are supposed to be properly instructed in the use of the sights; it is therefore unnecessary for me to go into detail, and describe the difference of full, half, and fine sight. A half sight is generally recommended. I would rather choose a full one, as more likely to be uniformly taken.

The back sight that comes next in order is, I think, the horizontal bar, with a fine platinum line down the centre. This sight is much better than the V, if the edge is made sharp, which prevents

the double line being seen above the real one. A very useful addition was made to this sight by Lord Elcho, which served as a rough and ready sort of wind-gauge, quite sufficient for all field purposes. The bar had a number of fine platinum lines let in perpendicularly, each space being equal to so many feet or inches on the target: by this means allowance could be made without aiming off the bull's-eye, by taking the line of sight over one of the outside lines instead of over the centre one. If some sight of this description were fitted to the rifles used in shooting for the Queen's Prize, the results of the practice would even be more satisfactory than now. If the suggestion respecting a horizontal bar sight for Enfields, made at the late meeting of the National Rifle Association, is carried out, it will be one of the greatest boons conferred on Volunteers.

The bar sight, I need hardly say, is used with a bead fore sight, the size of which is made to suit the fancy of the firer. I prefer one of a fair medium size, coarse rather than too fine.

I have also seen this sight used by inverting the fore sight, and bringing the bead below instead of above the bar: this was, I think, merely the whim of its inventor, and I believe he has since discontinued the use of it.

The bar sight made in ivory with a black line is a good one; you have the lines much more clearly defined in ivory than when the bar is made of metal.

Mr. Newton, of Manchester, gunmaker, invented a most useful sight some two years ago. His patent consisted of a number of Venetian screens, which are raised and lowered by means of a rack and pinion; and as the screens are raised, all light below the sight is excluded. I have used this sight, and think it a good one. Newton's patent is fitted to almost any description of back sight.

Dr. Goodwin next brought out a sight which he called the 'Orthoptic,' by the use of which he got rid of much of the burr. The sight is thus described in the Volunteer's 'Book of Facts':—
'The system of shooting adopted by Dr. Goodwin involves the constant use of three sights or points of alignment on the rifle, and the advantages claimed for it are, *inter alia*, as follows: 1st, that when the sights are correctly aligned for any range, the shooter cannot vary his shots from any cause except unsteadiness, i.e., cannot take a finer or fuller sight, or take his aim without seeing the bead of the fore sight exactly over the platinum line of the back sight, which is

frequently done through inadvertency where two sights only are used; and 2nd, that a much clearer and better view of the target and sights is obtained by the exclusion of all light from the front except those rays which proceed direct to the eye through the small hole in the screen or eye-piece.

‘ This sight can be attached to the stock of any rifle, by means of a small foot-piece, by screws. It consists of an upright bar or rod of steel, upon which the frame which carries the disc and its eye-piece moves up and down, either by the use of a rack and pinion, a long screw, or a simple slide, at the option of the shooter, to the required elevation, where it is secured by a binding screw. The eye-piece, which is contrived to hold two or three differently sized discs, to be used according to the quantity of light, has a traversing horizontal motion in its frame, obtained by a micrometer screw, by which the bead is always brought over the platinum line by moving it in an opposite direction to the one used on the fore sight for any wind allowance. The elevation is taken by the sliding bar of the back sight, and the wind allowed for on the fore sight in the usual way, the eye-piece being then brought into the required position, i.e., so adjusted that the

bead still appears exactly over and apparently resting on the platinum line. If the adjustment shall have been correctly taken, any deviation from it or difference in the sighting for any number of shots is rendered nearly impossible.

‘ The disc or screen is either coated with dead black composition, or covered with india rubber or black velvet.’

Rifleman have also to thank the inventor of the above sight for the introduction of one which bids fair to exceed his former invention in popularity. I allude to the *Horizontal Bar Fore Sight*. It consists of a broad knife-edged bar with a vertical slit down the centre, the size of which may be increased or diminished at the will of the firer by means of a small key. The bar intersects the target, and by this means it is easy to tell if the sights are perfectly upright. The bull's-eye is made to form the bead, the line of light which appears through the slit becoming the stem; the ordinary aperture back sight is used in conjunction with the fore sight.

There is one point greatly in favour of Dr. Goodwin's bar-sight, i.e. that allowance may easily be made for a slight change or increase of wind, by running the bull's-eye along the top of the bar.

Dr. Goodwin has patented another 'Horizontal fore sight,' with a platinum line down the centre, instead of the small slit as described above, and has furnished me with the following description of his sights. He says: 'The sight first suggested itself to me some twelve months ago, when shooting at Sudbury. I was then using *three* sights on my rifle at the same time, i.e. a bead fore sight, a plain bar with straight platinum line on my Vernier back sight (without notch of any sort), and an "orthoptic" or eye-hole sight, which had a *lateral* traversing motion as well as a perpendicular one. Having put up the Vernier bar of the middle sight to the required elevation, and put on the quantity of windgauge requisite, by the fore sight gauge I adjusted the orthoptic so as to see the bead only just clear of the bar, and apparently resting on the platinum line of the back sight. When once adjusted, this arrangement prevented my varying my aim at all, as at every shot I saw just the same quantity of bead; and being tied to see it in this way by the small eye-hole ($\cdot 04$) of the orthoptic, I could not take fuller or finer sights, or wander off the platinum line inadvertently in any number of shots, so long as the sights retained the same position. My shooting was much improved by this arrangement *accordingly*.

‘I was shooting in this way at 500 yards, when I observed that when I put the bead actually on the bull’s-eye I lost it altogether in the black (I had been in the habit of always putting the bead just to the left of the bull’s-eye, never under it or on it), but the bull’s-eye itself, resting on the platinum line of the back sight bar, appeared exactly a bead sight, with a black bead and a white stem. I removed the fore sight from the rifle, and aiming at the bull’s-eye through the orthoptic and over the bar, with only the short radius between these two sights, I fired five rounds for four bull’s-eyes and a good centre. This satisfied me that the bead fore sight with two back sights was a superfluity. So I made myself a horizontal fore sight of the same pattern precisely as the one I now use, and found it to answer perfectly. I introduced this sight with a *daylight* line to the public last summer, as my Horizontal Bar fore-sight, and it has been successfully used by several good shots; but I never made any others than the one experimental sight with a *platinum* line, which I have now patented. The sight with the *daylight* line, though good as a target sight, where *white* is behind it, is useless as a military or sporting sight, where *dark* objects are around it, as the line is invisible except against *white*,

whereas the sight with platinum or other white line is even better as a target sight than the other, and can be used against objects of any colour. This sight is useful as a windgauge without motion, as in shifting it at the last moment in aiming, even to the edge of the target or beyond, you never lose your level, as the bar end is still touching the bull's-eye. As a military sight, I think it would be very useful in keeping the elevation, as it is much easier to see when a long line is above a line of men, than when a mere point is. I purpose to keep the block of the present Enfield sight to fix bayonets, and to place the sight above the nose cap, or a separate block to fold down with a spring, so as to allow the bands to pass over it.'

Lord Bury invented a sight during last season which was used with marked success, not only by himself but also by many other good shots. I believe several of the 'English eight' used this sight in the International match.

To enable Lord Bury to get rid of the burr, he reversed the V, and flattened the apex to one-tenth of an inch broad, down the centre of which a narrow slit is cut. The fore sight consists of a bead, with a fine wire stretched across the stem, one-twentieth of an inch from the top, the space

below the wire being filled up with ivory. The back sight is raised with the ordinary rack and pinion, and the fore sight has a lateral motion to allow for wind. I have never used this sight, but have heard those who shoot with it speak of its qualities in the highest terms.

The only remaining sight left for me to notice is the one I have used for some time, and I certainly consider it superior to any other. I allude to the '*Aperture*.' 'This sight (which was first publicly used in England by me) was manufactured by the Manchester Ordnance and Rifle Company, and is, as far as its inventor, Mr. Leece, is concerned, original; but he had been anticipated some twelve or fourteen years by Lord Vernon, who had used it in Switzerland in 1849 and 1850, and in whose possession were several specimens and varieties of it. This sight differs from all others in the following respects: The fore sight consists of the usual bed and screw traversing motion, for allowance for wind. The guard is a short tube, of about $\frac{3}{8}$ of an inch in diameter' (a slight alteration has since been made in the diameter of this tube), 'one end of which, being movable, admits of the insertion of a metallic disc, perforated by an aperture, from which the sight

derives its name. The sliding bar of the back sight is made a little wider than usual, and is furnished with an eyepiece; and in lieu of the usual platinum line or notch, is also pierced with an aperture varying in its diameter according to its distance from the eye, but of such dimensions as to give the shooter, in aiming, the following effect: First, the bull's-eye on the target, as seen through both sights, presents a central black spot; the aperture in the disc of the fore sight is just sufficient to include the bull's-eye, and also a narrow circlet of the white target; the fore sight disc and guard give the appearance of a black circle; the aperture in the back sight is also so dimensioned as to include the fore sight guard, and a similar quantity of the target. The effect of the whole is therefore a series of concentric rings or circles, the bull's-eye forming the centre (black), a circlet of target (white), the disc and guard (black), a second circlet of target (white), and the remainder, all black, being covered by the face of the sliding bar and its eyepiece.' I have not used one of the larger guards, but with them I believe these remarks about circles do not apply. Each fore sight is provided with several discs, having their apertures adapted to the apparent sizes of the bull's-eyes at the different

ranges, and interchangeable as required. Lord Vernon's sight—who as an amateur, had anticipated this invention by several years—is almost a fac-simile of the one just described. Its guard is a tube of very similar dimensions, and contrived to hold at pleasure discs of various powers and of beautiful workmanship, which his Lordship had had made in Switzerland, and with which he had tried numerous experiments.

‘These discs embraced almost every variety of cross-wire sights, as well as aperture, round and square; and bead sights, made from the diamond, ruby, emerald, pearl, and enamel, had each been experimented upon in its turn, with varying success.’

In my opinion, there is only one objection to the aperture sight, i. e., that it is too great strain on the eye. Mr. Walker in ‘The Rifle, &c.’ just published, makes the following remarks on the aperture sight. He says: ‘It is evident that much light is shut off by all these plans, and therefore the aperture sight is useful chiefly at short ranges, unless the day is bright and the air clear.’ I feel bound to differ from so good an authority; for if the sights are properly made, nothing but a fog, or the sun shining straight into your eyes, will prevent you seeing *clearly through* the apertures. The great error

in making an aperture sight is, to have the hole in the back sight too small, and the one in the fore sight too large.

There is one very strong point in favour of aperture sights, i. e., that I believe the constant changes from sunshine to shade and *vice versâ* do not influence the aim, and I am not aware that this can be said of any other sight at present in use. I have been led to make this remark, from the experience of many hundreds of shots fired in all weathers. With all scientific shots the practice of marking the back sight with a knife has quite exploded, and by the use of the Vernier the shooter is enabled to note down his elevation in hundredths of an inch, or in degrees and minutes, the latter being the more scientific way. There is a great advantage in using the Vernier, i. e., having found the elevation for any one range, it may be found for any other by adding or deducting the number of hundredths of an inch or minutes which the ascertained elevation is above or below the average.

Having described the various kinds of sights, a few words of advice as to their use will not be out of place.

I am greatly in favour of a moderately quick *aim*. Colonel Hawker says--and experience has

proved to me the correctness of his statement—
'The *first* sight is unquestionably the best.' The hand never obeys the eye so readily as at first sight, and the longer you strain the eye the more indistinct the object aimed at appears; therefore, if the aim is not satisfactory at the first attempt, bring the rifle down, and allow the eye to rest for a few moments.

Never fire a shot before you are perfectly satisfied with the correctness of your aim, from any foolish feelings that you are keeping the rest of the squad waiting.

In using an Enfield or bead fore sight, there are several ways of placing the bead on the target. Some shots place the bead *on* the bull's-eye, others make a figure of eight by placing it under, whilst others align the fore sight with one of the corners of the bull's-eye. I do not think that one plan can be recommended before another, therefore this point may safely be left as a matter of choice.

When a man is satisfied with his aim, the next thing is to ensure the rifle going off at the right moment. As I have before said, this most important part of the whole business may be learnt without firing a shot. The moment the *aim is commenced*, a gradual pressure should be

put on the trigger, so that the slightest extra squeeze will cause the hammer to fall the instant the aim is perfected. Some good shots attempt to hold the aim for some moments, without the least knowledge when their rifles will go off. This is diametrically opposed to the great principle of shooting, i. e., making the finger obey the brain.

AMMUNITION, LOADING, ETC.

ONE of the great secrets of good shooting is to see that your ammunition is of the first quality, and in proper condition. Bad ammunition produces evil results in many ways, by causing an uneven and uncertain flight of the bullet, and also by increasing the fouling. Let a man once feel that anything is wrong with his powder, &c., and confidence from that moment is lost.

It is needless to say that regularity in the charge is of vital importance. In Enfield matches, where the competition is confined to Government ammunition, with orders not to inspect the cartridges before using them, as at Wimbledon, a man must then take his chance, and trust to good fortune giving him ammunition with evenly-measured charges of powder, properly finished bullets which are not minus the wooden plug, &c. I believe the Government ammunition—1863 make, wrapped in water-proof paper—is *very good*, and may be relied on for accurate

shooting. There are many matches where there are no restrictions as to ammunition ; and for such as these, as also for private practice, a few hints may be useful to some of my readers.

First, as regards powder. There should be no false economy used in purchasing this all-important agent to rifle-shooting : it cannot be too good. The refuse of the powder fouls the barrel, and the greater the amount of dirt, as a natural consequence, the greater will be the fouling. Experience has proved to me that the very best powder is the cheapest in its results.

It is not my object to attempt to prove that one maker's powder is better than another ; however, I may say that I always use Curtis and Harvey's No. 6.

Mr. Whitworth recommends No. 5, made by the same firm, but I am so well satisfied with what I have always used that I see no reason to change.

Uniform strength of powder is a matter of great importance. This can rarely be obtained with sufficient accuracy when single canisters are bought from different gun-makers as they may happen to be required. I always buy, every spring, the stock of powder that will last me *through the season* ; and to ensure a greater

regularity in its strength, I empty the canisters and mix the powder. After refilling the cases, I store them in a perfectly dry place, where the temperature is likely to be uniform. Those who object to keep any quantity of powder about their premises should always patronise the same gun-maker, and ask him if possible to supply it from the same make as their last purchase. Colonel Hawker speaks highly of unglazed powder, as being stronger than glazed, and thinks that the glazing process is only used to please the fancy of dandy sportsmen. Captain Lacy, in his 'Modern Shooter,' makes the following most useful remarks; I therefore quote them for the benefit of those who have not read his work. Speaking of gunpowder, he says—'It is the very life-blood of shooting; for if indifferent, the very best guns are comparatively of but little use. If good at first, and afterwards kept perfectly dry, as it ought always to be, it will retain its virtues unimpaired for a considerable time; but if it once get damp, and particularly if it remain so for any time, the grains have a tendency to dissolution or decomposition, which no after-drying can ever so fully recover as to restore the powder to its pristine strength. It ought to be kept wholly excluded from atmospheric influence, as the salt-

petre, especially if not of the purest kind (and it is often impregnated with marine salt, which vastly increases its tendency to absorb moisture), readily imbibes damp; and powder will preserve its strength—to say nothing of greater safety from accidental explosion—better for two years in tin than for one in wood. When, therefore, either a sportsman or a retailer in the country receives his fresh powder from the maker or the gun-maker in sealed packets or in pound canisters, he should forthwith take them out of the cask, and put them into a large canister or other metallic magazine made for the purpose, with a close cover and padlock at the top, and place it in a dry situation—say against the wall near the kitchen chimney; and it may be observed, that powder sent in sealed packets should be immediately poured from the paper in which it is enclosed into empty dry canisters, and be corked tight with an india rubber cork.

‘The months of June and July are the most advantageous for laying in a season’s stock of powder.’ This alludes, no doubt, to game shooting: for riflemen, I should say that spring was the best time; ‘and to be always sure of the best, it should be had direct from the *manufacturers themselves*, and, if possible, warm from

the mills, as that of the most recent manufacture (which the makers' trial has proved to be the strongest), canistered immediately on the spot, is the best. But if sportsmen do not procure their powder direct from the mills, in pound canisters, packed in a cask, they will be best served by the gunmakers, who generally lay in a fresh stock for sale a month or two previous to the commencement of the shooting season, and when their old stock will, probably, have been nearly exhausted; moreover, they usually procure the best powder, because on that the killing of their guns must depend, and, for a similar reason, are careful to keep it dry, for which purpose they, in general, have better convenience than the shop and warehousemen who sell so many different articles, and who seldom have a place set apart for gunpowder. At the gunmaker's, too, you generally find a larger assortment, as they keep the powder of different first-rate makers, to suit the various fancies of the customers.'

The above remarks were written some twenty-five years ago, but most of them are useful hints to shooters of the present day. I heard a gentleman at the last Conference object to Small-bore shooting, because, he stated, it was necessary to weigh every charge, I did not contradict him at

the time, but I can only say that I never fired a shot with a weighed charge during the whole of last season, which was decidedly my most successful one. I formerly weighed both powder and projectiles, but discontinued the practice as unnecessary. There can be no objection to weighing the charges for those who choose to take the trouble, but I cannot think they are in any way rewarded for the hours spent every evening weighing out the powder for the next day's contest, which might be much better occupied either in taking rest or exercise. Flasks are now made which, if properly used, are as accurate as necessary. From experience I am led to believe that one or two grains of powder, above a certain charge, makes but a few inches difference in the elevation at long ranges; and even the best of our riflemen have not arrived at that point of perfection to be able to shoot to inches at 1,000 yards.

There are many ways of using a flask, but it matters little which way it is charged, provided the same plan is always adopted. I give my flask nine taps against my hip, and find I can shake within a grain, having carefully tested this with scales.

There is a great diversity of opinion as to

what is the correct weight of the charge of powder; opinions vary from 70 to 110 grains. I believe a medium charge to be the best, and cannot do better than quote the views of Mr. Leece, one of our most practical riflemen. He informs me that he has ascertained from numerous experiments that a barrel three feet long will only consume about 84 grains of powder, and that all above that weight leaves the muzzle unconsumed, and merely helps to foul the rifle. He advises those who load from the flask to fire with 85 grains, thus leaving a slight margin for inaccuracy of measurement.

A uniform weight of bullet is a matter of great importance at long ranges. I never weigh Whitworth's hexagonals, having perfect faith in their accuracy; but were I shooting with the ordinary cylindrical projectiles, I should pass them quickly through the scales, for I have found a difference of 10 grains in the weight of two bullets from the same box, and I need hardly say that this would make a bull's-eye into a ricochet at long range.

Having impressed upon my readers the necessity of having good ammunition, the next point of consideration is, how to make proper use of it. There is more in loading a rifle properly than is

often imagined, and much of the fouling is caused by a want of knowledge upon this subject.

I think it a bad plan to commence shooting a match with a perfectly clean bright barrel, as it generally takes two or three shots to settle the rifle down to its regular shooting, and for this reason, that when the barrel is clean, the bullet meets with less resistance than when a certain amount of fouling has accumulated, and consequently the first few shots will go higher than those that follow. I have seen some shots of high repute flash off a small charge of powder before beginning to shoot, without using either lubricator or bullet. Nothing to my mind is so bad as this, the loose powder fouls the barrel to such a degree, that no good shooting will be got out of it until it has been thoroughly cleaned. This circumstance was thoroughly exemplified during the late trial of Small-bores at Woolwich, when a charge of powder fired without a bullet seriously diminished Mr. Henry's chances of success.

There is much difference in the shooting of a warm and cold barrel, more particularly after a number of shots have been fired; first, in consequence of the expansion or contraction of the metal; and secondly, if the barrel be allowed to go cold, the fouling becomes an incrustation,

through which the bullet has to force its way. If any delay has been caused during a match, such as stopping for the markers to dine, I always throw away a couple of shots before again beginning to shoot, to endeavour, if possible, to bring my rifle to the same temperature as when I left off, and also to moisten the fouling; were I to fire with a cold barrel, I should expect a ricochet, and I doubt not that my expectations would be realised.

It is well to adopt one uniform system of loading, both as regards the manner of so doing, and also as to the time you should allow a charge to remain in the barrel before discharging it. I would recommend that the ramrod be marked, to serve as a guide in pressing down both lubricator and bullet, for if the lubricating mixture is one time allowed to rest on the top of the powder, and the next the powder is forced into the wad, the same results cannot possibly be expected.

I would recommend a Small-bore, in fact any rifle having a platinum nipple, to be loaded with the lock at half-cock, as there is less chance of a miss-fire, by a free current of air having passed through the touch-hole. I have also found it a good plan to breathe down the barrel after each shot; it helps to keep the fouling moist, and to

force out all foul smoke, &c. I have noticed that many men are in the habit of wetting the bullet in their mouths before loading; but I cannot say much in favour of this, as it is likely to cause the paper to adhere to the lead instead of leaving it the moment the bullet is free from the muzzle: the idea, no doubt, is to assist the lubrication. I have always found it beneficial to cut a few slits in the paper with my penknife, both with the Small-bore and Enfield: this plan leaves the bullet free to escape from its small paper cage, which would materially affect its flight were it to accompany it on its journey. The greatest care should be taken not to injure the point, or any part of the bullet, by excessive ramming home; it is not at all uncommon to hear a Volunteer make his ramrod ring and rebound half way up the barrel, from his mistaken notion, taken, perhaps, from watching some old game-keeper, that it is necessary to drive the bullet well into the powder. It is, of course, a matter of importance that there shall be no space between the lubricating wad and the powder, and between the wad and the bullet; but this can be avoided without inflicting severe blows on the point of the unfortunate bullet. Care should be taken *to load with the rifle perpendicular*, otherwise the

powder will be apt to lie unevenly, and a greater explosive force will be offered to one part of the bullet than the other.

Having attempted to describe the manner of loading, I will now say a few words about the time a charge should be allowed to remain in the barrel before discharging it; in other words, the proper time to wait before reloading after delivering your fire. Of course, it must be understood that these and many of my remarks refer only to target shooting.

In laying down any rule for loading, the state of the weather should be considered; for instance, on a cool day, it matters very little whether you load soon after you have fired, or whether you wait until it is close upon your turn again to fire, provided you adopt the same course throughout the match. On a burning day, however, such weather as we had at the last Wimbledon Meeting, it is a decided mistake to load immediately after firing; for the lubricating wads are half melted to begin with, unless care be taken to keep them otherwise, and if allowed to remain long in the hot barrel, they soon become an oily substance, run into the powder, and uncertain shooting is the result. This remark also applies to the Enfield, as the wax and tallow will soon melt in

a very hot barrel. I extemporized a kind of refrigerator during the very hot days at Wimbledon, which kept my bullets and wads in good condition even on the hottest day. I bought a basket of fruit: having helped to demolish the contents—which, by-the-bye, didn't spoil my shooting—I placed my ammunition in the basket and covered it over with a wet cloth, which enabled me to indulge in the luxury of iced bullets. I think as a general rule the following plan of loading is the best, as it is suited to all weathers. After firing, supposing my name to stand first on the register, I allow my rifle to cool, and commence to reload when the last man but one of the section is in the act of firing: by this means, if all goes on without interruption, I manage to load and fire with my barrel at about the same temperature.

These and most of my remarks are intended to apply equally to Small-bore and Enfield.

I would strongly advise, when any doubt exists on the mind of the firer about the quality of either powder or bullet in any particular charge, that it should not be hazarded at the target; for instance, a loose-fitting bullet in a package of tight-fitting ones will always give a ricochet, *the proper expansion not having taken place.* I

have proved the correctness of this remark on very many occasions.

It is a great mistake to continue firing after the rifle has begun to foul badly, which is at once ascertained by the difficulty of forcing home the bullet. A foul barrel will drop its shots in spite of all the firer can do. I have known a rifle in this condition ricochet at 800 yards with the sight adjusted for 900 yards. If a rifle is really very foul it is best to have it properly cleaned at once; but slight fouling may be got rid of in the following manner: load with half a charge of powder; after working the dirt down on to the powder with a scratch-brush—or mechanical rod if using a Small-bore—put two lubricating wads down the barrel, and between them several drops of water, then place the bullet. After firing off the charge the barrel will be comparatively clean.

With all Small-bore rifles fitted with the mechanical loading rod, any great accumulation of fouling is done away with. That is, if the rod is properly used. Formerly I used to find my rifle beginning to foul after the 20th or 25th shot, but since using Whitworth's loading rod, or 'scraper' as some call it, I can fire one hundred or more rounds, *if required*, without the slightest variation

in the elevation being caused by a dirty barrel. Some rifles foul much more than others in consequence of the shape of the grooves, but the manner in which a rifle is cleaned has often a great deal to do with its fouling. If dirt or the least spot of rust is allowed to remain in the barrel, a man should not blame the maker of his rifle if it will not shoot.

The habit of putting some fine powder in the nipple, when a gun misses fire, and then firing at the target, is strongly to be discouraged. In the first place there is an uncertainty on the firer's mind as to whether his rifle will go off or not; consequently, if it does go, the shot will most likely be a bad one, as a hang-fire will in all probability follow a miss-fire, and the perfect accuracy of the aim is destroyed.

METHOD OF CLEANING A RIFLE AND KEEPING IT IN PROPER CONDITION.

A FEW remarks on the method of cleaning a rifle, and keeping it in condition when cleaned, may prove of use to those who undertake this part of a rifleman's *duty*. There are several ways of cleaning a rifle after firing, some men swearing by one system, some by another. I know an excellent shot who never goes through the ceremony of cleaning his barrel, but merely runs an oiled rag once or twice up and down, and to prevent it from rusting he excludes all air by stopping up the muzzle and touchhole with a lubricating wad. There is also another noted man amongst riflemen, both as a shot and an inventor of sights, who discards even the oiled rag, and fires some hundreds of rounds out of his rifle without cleaning in any shape or form. Both these methods are a very comfortable way of doing business, for after a hard

day's shooting, and a good dinner, one certainly turns out very reluctantly to clean a rifle; but neither of them are ways I would recommend.

It is stated by some practical men that water should never be used in cleaning a rifle, but that oil only should be used until the barrel is clean. I must say I do not agree with this, for I feel sure that oil will not remove all the fouling, particularly out of the corners of the grooves, and by the use of oil much dirt is likely to be forced down into the breech.

I have for some years adopted the following method, and found it to answer better than any other. I use hot water to remove all fouling, and force it well through the touchhole; after this is done, I am most careful to get the barrel perfectly dry (this is, of course, a matter of the greatest importance). I leave the barrel for about half-an-hour, and again rub it well out with dry rag or tow; a thin rod of iron made hot and passed down the centre of the barrel will insure it being perfectly dry. After drying the barrel I apply a small quantity of oil. As a matter of course, I remove all dirt and fouling from the stock and barrel, particularly about the lock. On the following morning I again wipe the barrel out with clean tow or rag, to remove

the superfluous oil, and to satisfy myself that no rust has made its appearance during the night.

To clean a rifle properly, it is better to have three kinds of oil. Linseed is best for the stock; Neatsfoot is what I should recommend for the barrel—it may be got clarified from most druggists. The oil issued by Government is the Rangoon earth oil; I have tried it, but prefer Neatsfoot. The oil used for the lock cannot be too pure, to prevent as much as possible the movable parts from becoming clogged; a single drop applied to each part where there is motion will be found sufficient: the oil used by watch-makers is the best for this purpose. Nothing is so likely to put a man off his shooting as his lock being out of order, as it is an important agent, acting between the mind and the rifle.

I consider that one of the great secrets of good shooting is for a man to clean his own rifle; he would, indeed, be a good man that I trusted to take charge of mine.

After making a rifle thoroughly clean, the next thing to learn is how to keep it in that condition. The greatest care should be taken to keep your tried and faithful friend free from all damp; for once allow rust to eat into the barrel, and the most delightful little receptacles

for fouling are formed, which all the mechanical rods in the world will not penetrate. I would never place a rifle, even in a case, near an outer wall, and during the recess I would examine it at least once a week. The following is Captain Lacy's receipt for preserving a rifle or gun barrel during the shooting recess:—'Get a strong wooden case (with lock and key), of interior dimension suited to the number and size of your barrels, and fit nicely into it a movable tin case or lining; and within this case, at a suitable distance from the bottom, fix a plate of tin, with round holes in it sufficiently large to allow the breech ends of the barrels to pass through and to keep the barrels upright. Clean and dry your barrels thoroughly; and having stopped the touchholes, vent holes, &c. with partridge feathers or otherwise, place them, breech downwards, perpendicularly in this case; then fill the case with the best neatsfoot oil, until the barrels are covered an inch over the muzzles; and when the oil is settled fill up again. Lastly, lock the box. Barrels kept in this manner will not require looking after for six months.'

I have never tried the above receipt, but feel *sure it will be found a good one.*

THE EFFECT OF WIND, AND THE
ALLOWANCES TO BE MADE
FOR IT.

I KNOW of nothing in rifle-shooting more difficult to acquire, than a thorough knowledge of the force of the wind, its effect on the flight of a bullet, and the proper allowances which ought to be made to counteract its influence. Dr. Inman, of Liverpool, has invented an instrument, called an anemometer, to indicate the pressure of the wind and its direction; but as riflemen are not supposed to carry instruments of this description about with them, it is necessary for them to form a scale in their own minds, that they may tell the force of the wind without the assistance of artificial means.

In attempting to become master of the wind, it is well to have some regular system of noting its force and direction. It is impossible for me to lay down any exact rule for registering the force of the wind; I can only describe the plan I adopt, and leave my readers to use their own

ideas in following it out. I divide the wind's force into six parts; and in remarking on it in my note book, I understand—

- No. 1. To mean a gentle breeze.
- No. 2. „ a moderate breeze.
- No. 3. „ a fresh breeze.
- No. 4. „ a strong wind.
- No. 5. „ a very strong wind.
- No. 6. „ a gale.

Of course this is a rough and ready way of estimating the wind's force, but I have found it to answer all practical purposes. The direction of the wind, as I have elsewhere mentioned, may be entered in your note book in many ways. I have used the three following, and like the 'watch' plan the best. When first I began to shoot, I entered the direction of the wind as front, rear, right, left, right front, right rear, rear right, and so on. I next registered the wind's direction by drawing an arrow in my book, but gave up both plans in favour of using the dial of my watch. I suppose the targets to stand at 12 o'clock and the firer at 6. The direction of the wind can in this way be registered with the greatest exactness, as you may have 48 different *divisions*.

Most of my readers will no doubt be aware without my informing them, that it is a most difficult matter to keep in the bull's-eye when the wind is constantly changing; indeed with an Enfield, a man is apt to consider himself fortunate if he keeps on the target under such circumstances. If the wind is the least unsteady, it is necessary to be ever on the look-out. On most ranges, especially during matches, there are flags flying, which assist to denote the direction of the wind. It is well to observe the direction, both at the firing point and also at the target, the smoke of the man's rifle who fires before you, will show you the former, and the marker's flags, or if you happen to be in a manufacturing district, the smoke from a factory chimney, will indicate the latter. I have found my ears particularly sensitive, both as regards the direction and force of the wind, and many times with a rear wind blowing first over my right shoulder, then over my left, I have had to thank my ears for warning me of a sudden change, when I was lying down, and in the act of pressing the trigger.

For the information of those who are mere tyros in the art, it may be well to state, that a side wind naturally deflects the bullet in the opposite direction from which the wind is blowing;

consequently allowance has to be made in the aim, or by means of the wind gauge. It must also be remembered that a side wind has the effect of depressing the bullet, so that when increased wind allowance has to be made, a slight increase in the elevation is also necessary, unless the wind is more from the rear than the side, when, as a matter of course, a reduction would be required. A rear wind requires less than the average elevation, and one from the front more than the regular standard; but the increase and decrease is not in the same ratio, as a front wind has much more influence on the bullet than one from the rear.

I believe it to be necessary to make more allowance for wind blowing from the left than for one from the right, as in the former case the wind and the 'drift' are acting in concert with each other, whereas in the latter case they are struggling one against the other, and the drift partly overcomes the influence of the wind. By 'drift' is meant the natural tendency of the bullet to incline to the right, caused by the barrel having a spiral from left to right. This 'derivation,' as the French call it, is very great at long ranges. Mr. Whitworth furnishes the following table with *his rifles*, the correctness of which has often been

proved by Mr. Leece, in the covered gallery, up to 500 yards.

THE WHITWORTH RIFLE.

Amount of lateral deviation to the right, due to rifling.

100	200	300	400	500	600	700	800	900	1000	YARDS
2	5	9	14	20	27	35	44	54	65	Inches.

Having attempted to describe the effects of the various winds on the flight of the bullet, the next thing for me to endeavour is to point out how these effects may be counteracted.

First of all, in speaking of the Enfield or any other rifle with a fixed fore sight, I believe the great fault committed by most riflemen is that of making *too little* allowance for wind, for with such a sight they have to aim away from the bull's-eye, which seems to act as a loadstone to them, for it is almost impossible to persuade them that in order to hit the bull's-eye they should not aim direct at it. The following remarks from the pen of Mr. A. Fellowes, which appeared in the *Volunteer Service Gazette* February 27, 1864, struck me, when I read them, as embodying my own ideas. In a letter on the subject of wind-

gauges, &c., Mr. Fellowes writes:—‘ No sportsman, I need hardly say, ever makes use of such contrivances; he knows that one of the great principles of shooting consists in having faith to aim, on certain occasions, away from the object, either in consequence of the motion of such object, or the deflecting influence of the wind, or of gravitation on the bullet. Now, there is unquestionably a strong natural tendency to project a missile, on all occasions, directly at the mark.

‘ Inexperienced shots, and indeed many in whom the habitual use of firearms might have been expected to dispel the illusion, are very apt, at the moment of firing, to cheat themselves with the idea that a direct shot must strike correctly, although common sense shows the occasional fallacy of the supposition; the act is involuntary. A knowledge, then, of the amount of allowance, quickness in the application of this knowledge, and faith in the result, are qualifications on which success materially depends, and long experience alone can master.’

The above is a piece of golden advice which all riflemen should remember, for I feel sure that many a prize is lost by being afraid to aim well away from the target.

In the case of Small-bores, with all the won-

derful contrivances in the shape of wind-gauges, the necessity of aiming off the bull's-eye is obviated, and with a steady wind and unchanging light a man becomes a mere machine.

In using a wind-gauge, I have always found the following a good plan, particularly when the wind is gusty. Supposing the wind to be blowing from the right, I adjust my wind-sight so as to throw the shot, when the wind is at its calmest point, a few inches from the right edge of the bull's-eye, so that any increase in its force will only tend to drive my bullet farther *into* the bull's-eye, rather than *out* of it; in other words, I shoot up to the wind rather than away from it. The greatest care should be taken, when shooting on a strange range, to ascertain if there are any peculiar cross-currents. I have known it happen, that when the wind to all appearances was blowing from the right, allowance had to be made as if blowing from the opposite direction, to wit, the Stroud and Bourn Brook (Birmingham) ranges. A want of knowledge in these peculiarities, I need hardly say, is fatal to success, especially in matches where sighting shots are not allowed. I have arranged the following table of allowances, taken from the experience of many hundreds of shots fired during the last few years. The table

applies more particularly to the Whitworth Rifle, using 85 grains of powder, and Hexagonal Projectiles, but I have no doubt it will be found to apply to most Small-bore rifles. Perhaps it may be well to increase the allowance a little when using a smaller charge of powder and cylindrical bullets; and in the case of the Enfield, about half as much more allowance will be found correct up to 600 yards, and rather more than double that required for the Small-bore for ranges over 600 yards.

These calculations are made without taking the 'drift' into account; therefore the allowance for drift must be *added* when the wind is from the left, and *deducted* if from the right. The table is arranged for a wind blowing direct across the range; a proportional reduction will therefore be necessary as the wind approaches the front or rear.

ALLOWANCES TO BE MADE FOR WIND. 83

Scale of Allowances for Wind, in Feet and Inches, when Shooting a Whitworth or other Small-bore Rifle.

RIGHT WIND.

FORCE	1	2	3	4	5	6
YARDS	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
200	0 3	0 5	0 7	0 9	1 1	1 4
300	0 5	0 8	1 0	1 2	1 9	2 6
400	0 7	1 0	1 6	2 0	3 0	4 0
500	0 10	1 6	2 6	3 6	5 0	7 6
600	1 4	2 0	3 6	5 0	7 6	10 0
700	1 8	3 0	4 9	7 0	9 0	13 0
800	2 0	4 0	6 6	9 0	12 0	17 0
900	2 8	5 6	8 6	12 0	16 0	23 0
1000	3 6	7 0	11 0	16 0	21 0	30 0

LEFT WIND.

FORCE	1	2	3	4	5	6
YARDS	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
200	0 4	0 6	0 8	0 11	1 3	1 6
300	0 6	0 9	1 0	1 4	2 0	3 0
400	0 8	1 2	2 0	2 6	3 3	4 6
500	1 0	1 8	2 8	4 0	5 6	8 0
600	1 6	2 3	4 0	5 6	8 0	11 0
700	1 10	3 6	5 6	8 0	10 0	14 6
800	2 6	4 6	7 0	10 0	13 0	18 6
900	3 0	6 0	9 6	13 0	17 0	25 0
1000	4 0	7 6	12 0	17 6	22 0	34 0

ATMOSPHERE, LIGHT, AND SHADE.

I CONSIDER this decidedly the most important chapter in my little book, for one of the great causes of individual success in Rifle-shooting is being possessed of a practical knowledge of the effects of light and shade. Experience has taught me how certain lights and shadows influence the aim; and I have endeavoured to ascertain the reasons for such results. The unfortunate 'gas-pipe' is often blamed for many a miss, when in reality it has answered the aim (false through some optical illusion) much better than the firer imagined.

I am not aware that any work has hitherto been published on Rifle-shooting which has dealt successfully with that most important subject; for though all writers seem agreed that light and shade have their influence, yet none have explained their causes and effects. I have always considered that for a man to be a really scientific *shot*, he should at least possess an elementary

knowledge of optics, otherwise he will frequently be totally at a loss to account for what appear to him great eccentricities in either himself or his rifle. Put a rifle, correctly sighted, into the hands of a steady man accustomed to shoot, and if the light remain the same, he will no doubt produce good results; but let the light suddenly change, and his shooting will alter as quickly.

The atmosphere is found in its varied changes to influence the flight of a bullet.

The barometer and hygrometer are both useful in assisting to ascertain the required elevation—the former indicating the pressure of the air, the latter the amount of moisture it contains. When no other more important elements, such as wind, come into play, a low barometer will generally give a low elevation, and *vice versâ*.

The greater the amount of moisture as indicated by the hygrometer, the lower will be the elevation; in fact, if a heavy shower were to come on whilst shooting, I should, contrary to common opinion, at once lower my sight. Better shooting is generally made in damp weather than in dry: this is mainly owing to the fouling becoming moist, instead of forming in a hard gritty substance.

It is well understood that a dull grey light is

the one best adapted for rifle-shooting, when the targets stand out in bold relief, but unfortunately for riflemen this state of things does not always exist. It is therefore necessary to know what to do when a change takes place.

We are taught at Hythe that the sun shining on our right hand has the effect of lighting up the right side of the fore sight, and the left side of the notch of the back sight; and that, as a natural consequence, our aim is false, and we shoot to the left. All this is quite true, but I think for a man to become a really good shot he ought to know something of the effect of refraction, and mirage or extraordinary refraction. I believe it is said by some that refraction has but little influence on the aim. I must, however, differ from those who hold this opinion. It is pretty well known that if a tube be fixed firmly in a rest and aligned on any object, that the object which may be seen through the tube at one part of the day will be invisible at another.

Refraction is the effect which transparent mediums produce on light in its passage through them. The rays of light proceeding from a distant target would move in a straight line to the eye of the person taking aim, if the atmosphere *did not interrupt* or change the direction of the

rays ; when this change takes place the effect is called refraction, from a Latin word which signifies to break back. It is found that a ray in passing from one medium into another of different density falls obliquely, it is turned out of its course ; and popular experiment will serve to show this in a marked manner. If a shilling be placed at the bottom of an empty teacup and the cup at such a distance from the eye that the rim shall hide the shilling, it will become visible by filling the cup with water. In the first instance the rays reflected by the shilling are directed higher than the eye, but when the cup is filled with water they are refracted by its attraction. and bent downwards at quitting it so as to enter the eye. When the shilling becomes visible by the refraction of the ray, you do not see it in the position which it really occupies, but an image of it higher in the cup : objects always appear to be situated in the direction of the rays which enter the eye.

The bent appearance of a stick partially immersed in water, in an oblique direction, is due to the same cause. The refraction of the sun's rays by the atmosphere prolongs our days, as it occasions our seeing an image of the sun, both before he rises and after he sets ; for below the

horizon he still shines on the atmosphere, and his rays are thence refracted to the earth. So likewise we see an image of the sun before he rises, the rays that previously fall upon the atmosphere being reflected to the earth.

The phenomena of *mirage* or usual refraction in the elevation of coasts, ships, and mountains above their usual level when seen in the distant horizon, have been long known and described under the name of looming. The name of mirage has been applied by the French to the same class of phenomena, and the appellation of *Fata Morgana* has been given by the Italians to the singular appearances of the same kind which have been repeatedly seen in the Straits of Messina. The phenomena of the mirage are most frequently seen in the case of ships when they are just beginning to appear above the horizon. Mr. Huddart, Dr. Vince, and Captain Scoresby have described various appearances of this kind. In the sandy plains of Egypt the mirage is seen to advantage. These plains are often interrupted by small eminences, upon which the inhabitants have built their villages, in order to escape the inundations of the Nile. In the morning and evening objects are seen in their natural form *and position*, but when the surface of the sandy

ground is heated by the sun, the land seems terminated at a particular distance by a general inundation; the villages which are beyond it appear like so many islands in a great lake, and between each village an inverted image of it is seen. That the phenomena of the mirage are produced by variations in the refractive power of the atmosphere, may be proved by actual experiment. If the variation of the refractive power of the air takes place in a horizontal line perpendicular to the line of vision, that is, from right to left, then we may have a *lateral* mirage, that is, the mirage of a target may be seen on the right or the left of the real object, or on both if the variation of refractive power is the same on each side of the line of vision. If there should happen at the same time both a vertical and a lateral variation of refractive power in the air, and if the variation should be such as to expand or elongate the object in both directions, the object would be magnified as if seen through a telescope, and might be seen and recognised at a distance at which it would not otherwise have been visible. If the refractive power, on the contrary, varied so as to contract the object in both directions, the image would be diminished as if seen through a concave lens.

Excessive *heat* has its effects on the aim in rifle-shooting. On a hot burning day, when the whole atmosphere appears to dance, *less* elevation is required, as your aim is directed at an imaginary target, raised above the real one, in consequence of the great amount of refraction. This effect has been exhibited in a marked manner by Dr. Wollaston, by looking along the side of a red-hot poker at some printed letters, ten or twelve feet distant; at a distance of three-eighths of an inch from the line of the poker, an inverted image was seen. I feel a certain amount of diffidence in making any positive assertions as to the effect of various lights on the aim, but I have arrived at the following conclusions from experience, and believe them to be correct. The reasons for the required alterations in the aim may, I think, be accounted for in my remarks on refraction and mirage. From a series of experiments, I have been led to believe that, if shooting on a dull day, and the sun suddenly appears and lights up your sights, still leaving the target dull, *more elevation* will be required; that is to say, if you continue to shoot with the same elevation as you had before the sun appeared, your shot will fall *low*. My views on *this point* were strengthened last year at Wim-

bledon. I was watching a squad of first-rate men shoot in the first stage Queen's prize, at 600 yards. The day was rather dull, but the sun appeared every few minutes; and as sure as he made his appearance, so sure did the whole squad ricochet. If, shooting under similar circumstances, and the sun appears and lights up the *target*, you require *less* elevation. This was strongly exemplified at the Swiss target at Wimbledon.

If shooting on a clear, bright day, with the sun shining *on the target*, you will require *more* elevation when he is hidden behind a cloud; and *less* elevation will be required when the sun is hidden, if you were previously shooting with his rays shining on your *sights*.

I think the following rules will be found to apply to shooting at 500 yards, and allowances for other ranges may be taken from this:—

When shooting on a dull day, and the sun appears and lights up the *target*, aim two feet *lower*; if it appears in front, and lights up the *sights* and *not* the target, aim two feet *higher*.

When shooting on a bright day, with the sun in front, if he disappears, aim two feet *lower*. If the sun be at your back, or on one side, so as to light up the *target*, and he disappears, aim two feet *higher*.

The following experiments, made by Mr. Brazil, tend to substantiate my remarks. Mr. Brazil feeling convinced that refraction had much influence on rifle-shooting, fixed a rifle-barrel and sights firmly in a rest against the side of his house, and left it there for some months, carefully making observations almost every day. The target on which the experiments were made was placed 450 yards from the rest, and faced SSE., so that the sun set almost behind the target. The sights were aligned just under the bull's-eye on an average day, clear, but no sun, and as changes in the light and atmosphere took place, the target appeared unmistakeably to have moved.

On a damp, gloomy day, the target always appeared *low*.

Sun setting behind the target, the target appeared *low*.

On a clear, bright day, the target appeared *high*.

A gleam of sunshine on the target, *not* on the firer, the target appeared *high*.

When the sun went behind a cloud, the target would distinctly *drop*. The greatest difference observed between highest and lowest appearance was *five* feet.

KEEPING NOTES.

No careful man will ever think of shooting without keeping some record of his practice, not so much as regards the marks made, but with reference to the elevation, &c., he required in particular lights and winds. The rule of thumb is all very well for some things, but it is but a poor measure for rifle-shooting: changes in light and wind are so constant, and require corresponding alterations in the elevation, wind-gauge, or aim, that some accurately kept record is quite necessary to assist the memory.

Any system of keeping notes will answer, provided it is understood by the person intending to use it.

On arriving at a range for the first time, I think it a good plan to make a slight sketch of the ground, carefully marking all gullies, hills, &c., then note down which way the targets face, and anything that strikes you as likely to influence the flight of the bullet. Endeavour to find

out the true course of the wind ; in some ranges you will find this a difficult matter—the new Stroud range to wit—for flags will often blow towards all points of the compass at the same moment.

As the day passes, you will, no doubt, discover that the light is much worse at one part of the day than another, and also that the wind rises at about two o'clock, or it may be the contrary, and experience will prove to you which is the best time to shoot. A few careful remarks will, no doubt, be of advantage to you the next time you visit the range. I think it well to record the height of the barometer and hygrometer, as both, particularly the latter, are some guide as to elevation ; next I would make a remark as to the state of the atmosphere, whether objects appeared distant or near, the position of the sun if shining, the light, &c., then record the direction and force of the wind, and amount of allowance required to be made, either in the aim or by means of the wind-gauge.

There are many ways of recording the direction of the wind : it matters little which method is used if understood by the firer, but I think the face of your watch, as previously stated, *forms the most useful way* ; as, by supposing the

target to stand at twelve o'clock to face the firer standing at six o'clock, you may get 48 different directions, if so many are thought necessary. The force of the wind may be entered in the rough and ready manner I have already described, or by the more scientific system of miles per hour, but this requires the use of an anemometer.

After noting down all these circumstances, the most important is to record their effect on the elevation, &c. I think it advisable to strike an average of your sighting at all distances, and to enter in your note-book whether you require more or less than your regular standard; this will guide you in adjusting your sights for the next range. Should any change take place whilst you are shooting, endeavour to account for it; and after coming to some satisfactory conclusion in your own mind, remark on it in your note-book. It is well to know the exact difference every hundredth of an inch on the back sight and wind-gauge makes on the target, so that any error in elevation or direction may be corrected with the greatest accuracy. If every rifleman were to act up to the advice I am giving him, there would be little use in sighting shots, which, in my opinion, are both

wrong in principle and unfair, as they place the careful and careless shot on an equal footing, and, as some one remarked at the late conference, we could hardly expect our enemies to mark time whilst we had sighting shots at them.

POINTS TO BE REMEMBERED WHEN SHOOTING.

THERE are one or two useful points that a rifleman should not forget whilst engaged in a contest. He should give his whole attention to the work he has in hand; there are so many things that require constantly watching, such as a sudden change in either light or wind. We often see a man enter into an interesting conversation on some subject totally foreign to the one in which he is engaged; and after the officer in charge of the squad has had the trouble of calling out his name once or twice, he hurriedly goes to fire, fires away his muzzle stopper and ruins his rifle, or attempts to fire without even loading, or half-a-dozen things equally foolish. But not to appear too hard upon the poor man, I will allow that he has loaded his rifle, and goes prepared to make a bull's-eye; but in the deep interest he has taken in the conversation with his friend he has quite forgotten to notice that the wind has suddenly

changed, and probably a miss will *reward* his want of attention.

I would have a man seat himself away from the busy throng, and carefully watch all the elements likely to disturb the true flight of the bullet. If you have confidence in the shooting of one or two men who fire before you, watch where their shots are signalled; there may be a change in the strength of the wind which you do not perceive at the firing point, and a slight alteration of the wind gauge or aim may gain you a bull's-eye, which you would have lost had you not been on the look-out. Always try to *follow* a really steady shot; you may learn much from the position of his hits without asking him a question. If the sun is very powerful I would, of course, keep as much as possible in the shade, both to save my eyes and head. I have found a freshly-gathered cabbage leaf, placed in the crown of my hat, a most useful way of keeping the head cool. Avoid straining the eyes by looking through a telescope.

There is another point which should be avoided, and that is, being anxious to know what scores others have made. Make the best possible score you can, and leave others to do the same; the *fact of knowing* that Mr. So-and-So has made a *bull's-eye* every shot, will not in the least help

you to do so ; perhaps quite the contrary, by causing you uneasiness at a moment when you should be perfectly calm. Avoid disputes of any kind. You will nearly always find some one ready to object to something or other. Some men are never happy unless they are making others as miserable as themselves. If a man protests against anything I do, I simply go on shooting, and refer him to the umpire. Were I to lose my temper and argue the point, I should most likely also lose the match, and my friend would gain his point. I trust that this remark may not be misunderstood ; but as the exception proves the rule, so there are one or two objectionable men amongst the many thousand good fellows we meet at rifle contests.

I would strongly advise that a man should conform strictly to the conditions of a match, and never endeavour to take the slightest advantage of the rest of the competitors.

There is only one more point that strikes me, and that is, never to hurry to a firing point under the supposition that you are late, and on this principle : that if you run you may be in time : but you will have spoiled your shooting, and will be *sure not* to win. Whereas if you walk, you *may* be in time, and consequently *may* win.

DESCRIPTION OF THE PRINCIPAL
RIFLE RANGES IN GREAT BRITAIN,
WITH THE PECULIARITIES ATTACHED TO EACH.

I HAVE devoted this chapter to a description, taken from personal experience, of the various rifle ranges in England and Scotland, where annual meetings are held, pointing out any peculiarities of light or wind, and the best time of day to shoot, in the hope that my experience may prove useful to those of my readers who are strangers to any of the following ranges:—

BARTON MOSS.

The ranges of the 1st and 3rd Manchester Rifle Corps are situated here. The range is a dead level, and free from all eccentric cross currents or peculiarities of light and shade. The range of the 1st Manchester extends to 900 yards; that of the 3rd Manchester to 1,000 yards, with a resident marker, and every ac-

commodation for private practice. The targets face south-west, consequently the light is good all day. The prevailing wind is left or right rear, which generally dies away towards evening. Some excellent practice may be made about six o'clock. There is a railway station, London and North-Western Railway, within twenty yards of the 3rd Manchester range. The elevation required on Barton Moss is about the average.

SOUTHPORT.

This range is situated on the sands, and is available up to 1,100 yards. The targets, three in number, face south-west, which keeps the sun where it should be for rifle-shooting. I have always found the elevation very low on this range, and lower in the afternoon than in the morning; like all ranges situated on the sea sands, there is much mirage. There is nothing peculiar about the wind, excepting that you often have to shoot in a gale. The range is now leased to Mr. Blanch, of Liverpool, who provides a marker and every accommodation for those who wish to shoot, subscriptions being received by the year, quarter, month, week, or even day.

ALTCAR.

This is one of the finest ranges in England, as far as number of targets is concerned; they are placed against the sand hills, which form an excellent butt, and misses are easily seen by the bullet throwing up the sand. The light in the middle-day is not good, but towards evening it greatly improves. An average sighting on this range will be found correct. Care should be taken to notice the exact angle at which the various ranges are laid out, or mistakes in allowing for wind will occur; for instance, the second and first-class ranges gradually diverge, and if the wind is blowing from the right rear, you require *less* allowance for wind at 800 yards than at 600. I think the large sighting target is apt to deceive. I have found the elevation and wind allowance between the large and small targets quite different, particularly if there is any wind.

WIMBLEDON.

Every rifleman has heard so much of this famous range, the Newmarket rifle-range, that I need not say much in description of it. The range is a dead level, or nearly so; the targets *are placed against high earthwork butts, and face*

the east, so that the light is best early in the morning or late in the evening, in fact the best time to shoot is unfortunately after the markers have left the butts. The wind blows pretty evenly across the common, and is easily judged as regards direction by observing the long row of flags which fly near the council tents, and also the distant danger flag. At the 200 yards range it must be remembered that the wind comes sweeping up a gully and is apt to deceive in its force. The sighting at the Pool and 200 yards targets is not quite the same. I have always found the wind at Wimbledon steadier when blowing from the right than when coming from the left. The system adopted at this great meeting of having sighting targets, say at Nos. 5 and 6, and shooting for the prize at No. 25, is very apt to mislead the firer, as the targets lie at different angles, and for some extraordinary reason target V (1,000 yards) requires a rather higher elevation than target X, although they are close together. This is worth remembering, as the one is often used as a sighting target for the other.

The 800 yards Swiss target blighted the hopes of many good shots last year, for after making several consecutive bull's-eyes, and booking the prize as a certainty, the sun would suddenly

appear and a miss would be the inevitable result. In consequence of the target being composed of too thin material it became perfectly transparent when the sun came out, and one of the many optical illusions, the bane of riflemen, occurred, and instead of striking the bull's-eye as in former shots, the bullet passed some inches *over* the target. When making a good score it is a difficult matter to persuade a man to alter his sights, but if the Swiss targets remain the same transparent articles this year as they were last, I shall certainly lower my sights a twentieth of an inch, when I see the target suddenly appear like a sheet used to display a magic lantern. It should also be remembered that when the sun shines through the Swiss target it requires less elevation than the iron one, which is close at hand, and is used for sighting, as the sun acts on the targets in exactly opposite ways, lighting up the Swiss target, which causes your shots to go high, whereas the iron target remains dull, and your sights only are influenced, which will cause you to shoot low. There is much mirage at Wimbledon, and some strange optical illusions take place, which the firer should be on his guard against.

WIMBLEDON (Civil Service and London Scottish).

This range is situated a little to the right of that used by the National Rifle Association. The targets are placed against the side of the hill, and face NE.; the ground gradually slopes from the firing point to the target. I have twice used this range, and found the elevation below the average, especially towards afternoon.

LOUGHTON (High Beach).

This is a most picturesque range, but unlike most ranges where the scenery is really beautiful, there are no peculiar cross currents. The targets are placed against a wood, which forms a good background, and the light is good. The ground rises gradually from the firing point. I found the elevation considerably below the average.

HYTHE.

This vast Government range, used by the School of Musketry, is situated on the shingle, about half-a-mile from the town. It is, perhaps, one of the most difficult ranges in England to shoot well on. The mirage is considerable, the sun dancing on the bright stones in a most tiresome manner. There is often much

wind, which increases towards midday. Those of my readers who should happen to be selected by Lord Bury to compete at Hythe for the honour of representing England in the 'International Match,' should notice that the long ranges used for the competition lie at different angles, and that in moving from one to the other an alteration should be made both in elevation and wind allowance. When it blows at Hythe, considerably above the average allowance for wind will be necessary. On ordinary days the elevation is about the usual standard, but in hot bright weather the sighting is decidedly low.

BROWNHILLS (Staffordshire).

This range is generally used for the Stafford County Meeting. It is situated on marshy ground, consequently on hot days there is much mirage, otherwise the light is good. The prevailing wind is from the front. The 800 yards range is difficult to judge, as you shoot up a sort of cutting with an opening at the top; any change in the direction or force of the wind is not easily seen. Sighting is rather below *the average*.

BRISTOL (Sneyd Park).

This range is situated in one of those picturesque spots, which are not generally easy to shoot in, consequent on the prevalence of cross currents. The targets are placed at the foot of a high hill, and when firing at long ranges you shoot across the river. The range is bounded on both sides by high hills, which prevent the wind having full play, excepting from the left front. The targets face about south, so that the light is good; by this I mean, that the sun when out is on the targets. I should say, as a rule, that decidedly the best time of the day to shoot on this range is towards evening. I noticed the Bristol men waited until evening, and they should know the peculiarities of the range better than any one. I fancy the ebb and flow of the tide would affect this range, especially when the wind is from the left point, when I should expect it to rise with the tide.

YORK (Strensall Common).

The county meeting is held on this range. There is no background to the targets, consequently, in bad lights, they are rather indistinct. The ground falls gradually from the firing point, but in no way to influence the elevation. The

country is perfectly open, so that the wind has full play, and does not blow in treacherous and fitful currents. Sighting below the average.

BIRMINGHAM (Bourn Brook).

This is a level range, with the target placed against a high bank. The light is very bad towards evening, and decidedly the best shooting is made early in the morning. The target is seen with the greatest difficulty towards five o'clock when using aperture sights, unless there be a fine clear grey light. There is a peculiar cross current blowing from the left; for when the wind appears to be coming from the right, wind allowance is required as if it were from the opposite direction.

WELLS.

This is another of the pretty ranges; the targets are placed against a hill, and you shoot across a valley from rising ground on the opposite side. The light is good. If there happens to be a side wind, extra allowance should be made for it, as the current comes sweeping up the valley. The branches of the trees form a good guide if the wind is unsteady, as you may hear a gust coming up the valley before it actually reaches *you*. *I found the proportionate increase between*

500 and 600 yards did not answer on this range. Sighting decidedly below the average.

GLoucester (The Over Range).

This is a beautiful level range; the targets are placed against a high brickwork butt. Unfortunately they face the wrong way for the light, which is not good for long during the day; in fact, in the evening it is decidedly bad, and aperture sights are perfectly useless, so much so that I missed the target lying down at 200 yards. The best time to shoot is any time before noon. The wind is usually steady, and free from peculiarities. Sighting about the average.

HEREFORD.

This range is situated by the side of the river, about a mile from the city. The targets are placed against a hill, the ground gradually sloping towards the firing point. The range is protected on the left by a wood. The light is bad towards afternoon. Sighting below the average.

INVERNESS.

The prize meeting of the Highland Rifle Association is held here, and takes place during the Northern Meeting, so that, in addition to a most

liberal programme, there is plenty to attract an adventurous rifleman, should he wish to go so far north. Two years ago, I believe I was the only Englishman present, and was looked upon at the beginning of the meeting as rather insane; last year many of our best southern shots were present. Accommodation is at a high premium during the meeting, 10s. 6d. per night being no uncommon charge for a bed. The range, which is situated about a mile from the town, is a good one, there being no peculiarities of light or wind. There is no background to the targets; the sighting about the average.

STROUD—'Old Range.'

This range is beautifully situated as far as scenery goes, but I cannot say quite as much for it when shooting is concerned. The targets face the south, and are placed against the side of a hill, and so peculiar are the currents that it is not uncommon for the wind to blow from one direction at the firing point, and from another at the target, which is of course apt to mislead unless carefully watched. I believe under such circumstances as these it is best to aim direct at the bull's-eye. The elevation at 500 yards is below the average, and at 600 above it. A distant

factory chimney forms a good guide for the direction of the wind. The above description applies to the range used at the Stroud contest, 1863. This year it has been removed, and I am able to give a description of the

STROUD 'New Range,'

its peculiarities being unpleasantly fresh on my memory—unpleasant only as far as my own indifferent shooting with an Enfield is concerned.

The new range at Stroud is certainly the most difficult I ever saw to shoot well on; for what with extraordinary currents and constant changes in the light, it is almost necessary to alter your aim every shot. The range is *said* to be half-a-mile from the town, and so it may be from the extreme outside cottage, but it is at least a mile-and-a-half from the station. It is situated in a beautiful valley, some 300 feet deep, across which you shoot. The targets are placed about two-thirds up the side of the hill, the firing points being in echelon on the opposite one. At 200 yards you shoot very much up hill; at 300, about the same angle, down hill; and at 500 and 600, somewhere about level. The targets face about NW., the sun being in your eyes in the morning. I noticed that light and shade had a great effect

on the shooting at Stroud, and those who made no alteration in the aim to correspond with a change of light suffered in consequence; for, if shooting in the afternoon, with a dead grey light on the target, and the sun suddenly appeared and brightened up the target, you would see men, who had the shot previous made a bull's-eye, send the next a foot over the target. Some of our best Enfield shots appeared quite at home with the light and shade effects; but I think the wind at Stroud was the master of all of them. I never fired on such a range for wind, for when, to all appearances, judging from the flags, it was blowing strong from the *right*, aim had to be taken at the *left* edge of the target, to enable the shooter to hit it; but even this did not hold good for many shots, for, without any perceptible change in the strength or direction of the wind, you would, after making a bull's-eye, go yards to the right or left the next shot. A flag, placed on a high pole, is most required at Stroud, placed half-way down the hill, on the right of the target. The elevation is considerably below the average.

Nothing can be better or more comfortable than the accommodation provided for competitors. Covered sheds are erected at the firing points, *with seats*, and hooks to hang coats, &c.; the

greatest order and regularity prevail, and nothing but the selection of a time of the year when fine weather may be expected is required to make Stroud a popular meeting. Cold bleak March winds do not add much to the enjoyment of any rifle contest.

SHOTWICK.

The Cheshire Rifle Association hold their annual meetings on this range, which is one of the finest I ever saw. The range is situated on a perfect level of about 400 acres of meadow land. The targets, between 20 and 30 in number, are placed against a large sea wall, which forms an excellent butt. The light is good. There are no peculiar cross currents, and the force and direction of the wind is easily judged. The elevation required is about an average one. Shotwick is easily reached from either Liverpool or Chester; a liberal prize list, and most beautiful scenery, will repay any man for the trouble of a visit.

CONCLUSION.

HAVING loaded my rifle with what I hope is good ammunition, I fire this my first shot at the public, hoping that they in return will give me a bull's-eye, by not being too severe in their criticism on my attempt to assist my brother riflemen. I shall continue to take careful notes of all my practice, and should a second edition be required, I hope to be able to correct former errors, and give further information. Travestying England's brightest bard, let me say in conclusion :

‘ If public approbation I experience,
I'll fire another shot about a year hence.’

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