

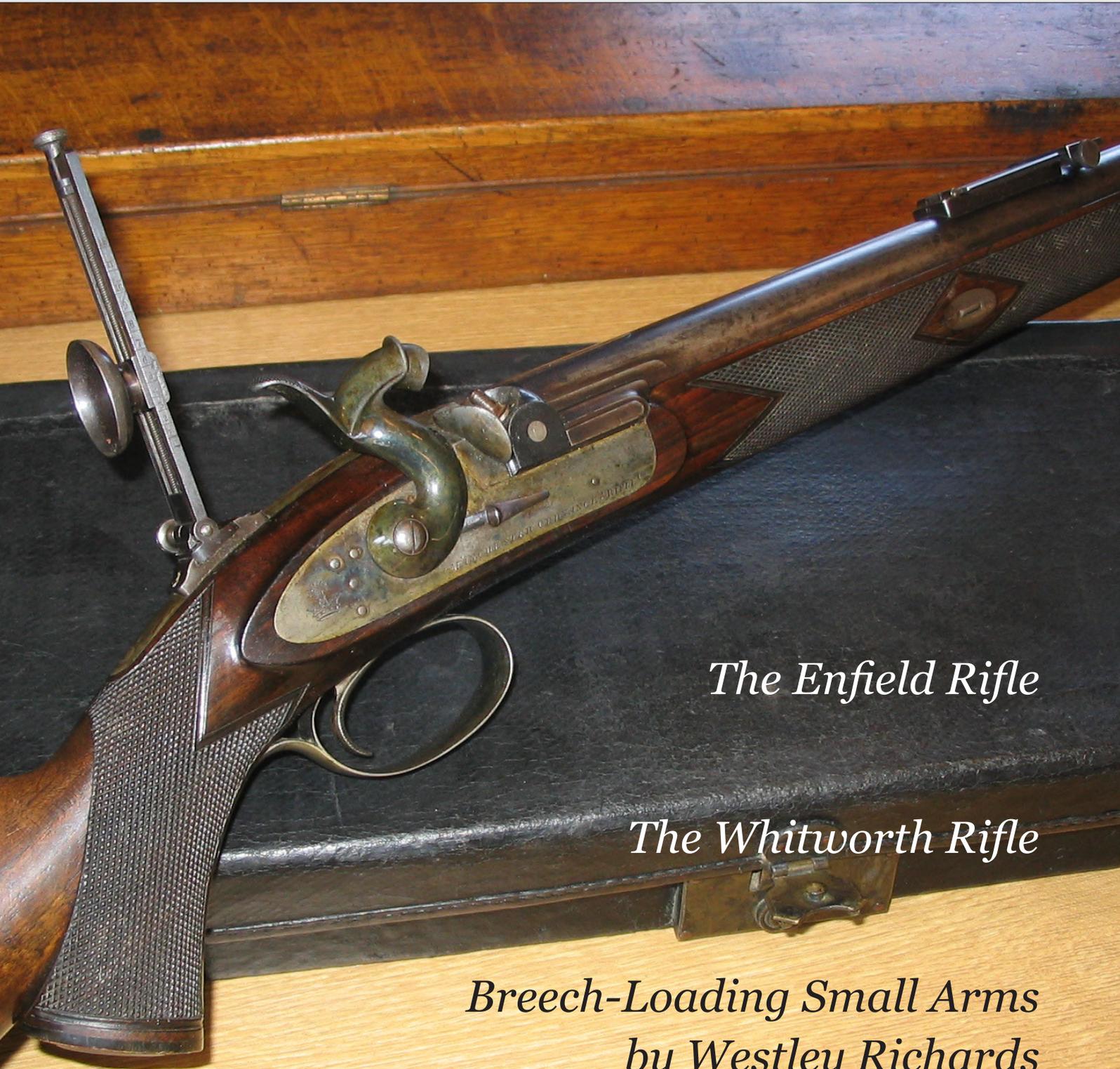


# Research Press Journal



Issue 1 | Winter 2018

[www.researchpress.co.uk](http://www.researchpress.co.uk)



*The Enfield Rifle*

*The Whitworth Rifle*

*Breech-Loading Small Arms  
by Westley Richards*

# Research Press Journal

Editor: David Minshall

[journal@researchpress.co.uk](mailto:journal@researchpress.co.uk)

## Firearms

- Long range rifle fire. Long range target rifles. British military longarms. Small arms trials. Ammunition. Accessories. Gunmakers.

## Marksmanship

- Military marksmanship. The art of shooting. Long range muzzle loading. National Rifle Association. Creedmoor and the international matches.

## 19thC Riflemen

- Those who pioneered the sport of target rifle shooting from the muzzle loading and into the black powder breech loading era. Biography.

## Rifle Volunteers

- The Volunteer Force was established in 1859. From 1881 territorial regiments included regular, militia and volunteer battalions.

[www.researchpress.co.uk](http://www.researchpress.co.uk)

© 2018 Research Press



While every effort is made to trace copyright holders, we may on occasion have failed and apologise to anyone whose rights may have been infringed.

# Contents

Issue 1 | Winter 2018

- 3 Priming**  
News, Events, People & Places
- 4 The Enfield Rifle**  
Manufacture of the muzzle loading Enfield rifle as reported in *The Times*, 1860.
- 10 Long Range Shooting with the Military Muzzle Loading Rifle**  
by David Minshall
- 12 The Whitworth Rifle: A Brief Introduction**  
by David Minshall
- 16 Hints for Long Range Riflemen**  
by Horatio Ross
- 17 First Hints on Rifle Shooting: Wind**  
by Alfred Paget Humphry
- 18 Private McVittie**  
by John & Robert Hyslop
- 19 Breech-Loading Small Arms**  
by Westley Richards
- 23 Thomas Wilson: his Patents, Arms and Ammunition**  
by Andrew Appleby
- 25 Frederick Prince's Breech-Loading Rifle**  
by Matthew Moss

## On The Cover

A Whitworth match rifle  
~ see page 12

# Priming

## News, Events, People & Places

### Research Press Library

Research Press has a library of free downloads, currently covering British gunmakers. Contents include a list of English and Welsh gunsmiths and gunmakers from around 1550 to about 1850, studies of gunmakers of Oxford, Probin gunmakers of 18th Century Birmingham, and Ketland guns in America. In addition, three articles discuss and illustrate the barrel markings found on provincially made British firearms. See: [www.researchpress.co.uk/index.php/publishing](http://www.researchpress.co.uk/index.php/publishing)

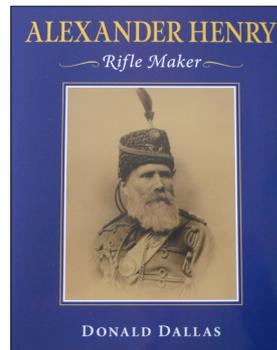
### LRML UK, 2018

Throughout the year the Muzzle Loaders Association of Great Britain (MLAGB) and the Long Range Rifles (LRR) Branch of the MLAGB run a series of long range muzzle loading events at Bisley, UK. Shoots are generally held over 2-3 days. LRR have published a combined calendar of the mid and long range events for 2018. See: [www.longrangerifles.co.uk](http://www.longrangerifles.co.uk)

### Spring 2018, Oak Ridge, TN

Details of the Spring 2018 long range muzzle loading match at Oak Ridge, TN, USA, have been published. It will take place on 29-30 March (Thursday & Friday), with shooting at 200, 300, 600 & 1000 yards. Cover sheet, registration and match rules can be downloaded from: [www.researchpress.co.uk/index.php/news/spring-2018-oak-ridge](http://www.researchpress.co.uk/index.php/news/spring-2018-oak-ridge)

### Alexander Henry, Rifle Maker



Published late in November is Donald Dallas' book 'Alexander Henry, Rifle Maker.' It gives an in depth history of the Edinburgh rifle maker, whose rifling was famously used on the British Army Martini-Henry rifle. Revered for their accuracy, his rifles received orders

from British and European royalty, the aristocracy, Indian Maharajahs and big game hunters.

Published as a private publication for Donald Dallas by Quiller Publishing 2017. 12"x10" hardback, 328 pages 350 photographs. Price £60 excluding postage.

For further information see:

[www.donaldallas.com](http://www.donaldallas.com)

### Whitworth Rifle Owners

Owners of original Whitworth rifles are encouraged to attend the Spring 2018, Oak Ridge shoot. There, Tom Rowe will be photographing and documenting rifles for a forthcoming book, that builds upon the many years of research undertaken by Bill Curtis in the UK.



# The Enfield Rifle

*The following article was originally published in two parts in The Times (London), on Thursday 2 February 1860 and Saturday 4 February 1860.*

## Part 1

Some three or four years ago many of our engineers, manufacturers, and scientific men were deluded into going over to New York in the expectation of there seeing an industrial exhibition. Among others so misled was Mr. Whitworth, who, like all the rest, finding nothing worth looking at in the exhibition itself, tried to recompense himself for his visit by inspecting those manufactories which most abounded in the labour-saving machines which are used more or less extensively throughout the States: The two great centres for machinery of this description were at the United States' arsenals at Springfield and, Harpers Ferry, and these accordingly Mr. Whitworth visited, saw the various processes there pursued of making small arms in thousands by machinery, and reported to our own Government strongly in favour both of the plan of the Government making its own weapons, and the means by which it could best be accomplished. The War-office, on receiving this report, adopted it forthwith, and, to their infinite credit, at once took a step which at the time even the most strenuous friends of progress in their secret souls scarcely approved. They sent out a commission, of which Mr. Anderson, now the chief superintendent of the Armstrong Gun Factory at Woolwich, was at the head, to make further inquiries into the subject of Mr. Whitworth's report, and with power not only to order machines in America, but to engage American engineers to superintend them. This was the commencement of the now famous Enfield factory, and this is the first

---

*The first thing that strikes a visitor on entering the forges at Enfield where the barrels are made is the apparent rudeness and inadequacy of the machinery to its purpose.*

---

instance in which the English Government have ever had to send abroad either for machinery or men to work or make it. To their praise be it said they at once overstepped the formidable though narrow boundaries of national prejudice, and looked only for that market in which what they wanted could be best and easiest obtained. For a short time several of the new machines were erected and worked at Woolwich; but, when "Brown Bees" was no longer paramount in the service, it was determined to create an immense establishment for the manufacture of rifled small arms, apart and in itself distinct from the operations carried forward at the arsenal. A small shop, if we may so term it, for the manufacture of gun-stocks had always existed at Enfield, and this led the Government to turn their eyes in that direction, and once the place was seen, their gaze was, so to speak, fascinated. It was not at all the beauty of the spot which induced the Government to select it, for, in truth, a flatter or more dreary-looking waste, save Aldershot, was never seen. It was certainly not its salubrity, inasmuch as the whole country is eminently damp and unhealthy; neither was it either its convenience of access or its vicinage to skilled labour, for in both these requisites it was and still is singularly deficient as compared with other neighbourhoods. The reason why the Government selected it was, entirely independent of all these considerations of fitness, and due only to the simple fact that near the shop before alluded to was a canal which turned a waterwheel exerting some 20 or 25 horse-power. The idea of economizing and bringing into play this little waterwheel (which has now ten times its power of steam machinery to assist it) settled the whole affair. Foundations were laid and buildings commenced forthwith, and factories the size of little villages sprang up with more than the rapidity of colonial enterprise. Already the nucleus of a small town is fast gathering round the works. Hucksters' shops, workmen's houses, and small hotels are dotted here and there; and as it becomes easy now to calculate when, according to the natural course of things, "Ordnance Enfield," as it is called, will some day become a town clamorous for corporate rights and the privileges attaching to its own M.P. And all these changes will be due to an old waterwheel which the Government could have got anywhere,

and that, too, without the drawbacks attendant upon a superabundant supply of the pure element which turns it, and which occasionally hides the face of the surrounding country at Enfield, and places the floors of cottages and houses some inches under water. However, we suppose we must not quarrel with any cause which produces an effect so perfect in itself, so economical in its work, and so admirably managed, as the factory at Enfield undoubtedly is. It used to be a general remark, and one pretty generally believed, that Government could never compete advantageously with private manufacturers, and, to do them justice, the Government occasionally gave great force to the observation by rashly entering into contests with the trade on most unequal terms. At Enfield, however, they have discarded the usual routine. There is no costly system of supervision; on the contrary, everybody connected with the place is rather underpaid. The Government only seek there to make their own weapons, and intrusts all the means and appliances to the hands of private engineers of acknowledged, though unofficial, capacity. Mr. Burton, an American gentleman, is the working and real head of the factory, and to his untiring skill and diligence its singular excellence is due.

With such tokens of military ardour as now so extensively prevail throughout the kingdom the Enfield rifle is likely to become not only a household word, but almost a household weapon. At such a time, therefore, some account of the manufacture and peculiarities of this most effective, but most easily injured weapon, may be of interest, and, if it does not make our young volunteers good marksmen, it will at least put them on their guard against such careless treatment of their pieces as may put it out of their power ever to hit anything with them smaller than a haystack.

The first thing that strikes a visitor on entering the forges at Enfield where the barrels are made is the apparent rudeness and inadequacy of the machinery to its purpose. It may be urged that it makes the barrels very well, but the same excuse might be advanced for non-improvement in every stage of manufacture, and we are sure that among the clear-headed American mechanists now at the works are many who could at a day's notice devise

---

*It would be difficult to name any  
factory room in the kingdom,  
which at the first glance presents  
such a bewildering scene  
of active, never-ceasing industry.*

---

a far better apparatus for working up the iron of the barrels than that now in use. The materials for the barrels are brought to the factory in short square slabs of wrought iron (with the fibre of the metal crossing and recrossing at right angles), each some 12 inches long by 4 broad, and half an inch thick. These are heated and bent into a short tube, having somewhat the appearance of a rough and ill-made draining tile, and in this state are again heated to a bright white, and passed between iron rollers of the first gauge, which weld up the joining down the middle, and, by compression, lengthen the tube about 2½ or 3 inches more. It is again heated, and again passed between rollers of a smaller gauge, which lengthens it still further; and so on, again and again, until the operation has been repeated through 13 different gauges, when the rolling is complete, and the barrel – after some two hours' manufacture – emerges at last a slender rough iron tube about four feet long, and having a hole down the centre the size of a large pea. The muzzles are then cut off, the “butts,” or ends, as they are termed, made up, and the process of welding on the “cone-seat,” or nipple for the cap, commences. This latter is a difficult operation, and one which requires no little quickness, care, and skill on the part of the workman. To insure rapidity of striking while the metals are red-hot, the breech of the barrel with the cone-seat is placed in a steel die under a small hammer worked by steam, which strikes at the rate of 400 blows a-minute, and under which, amid a terrific din, the metals are crushed together, with more than the strength of one piece.

This completes the forgings, and the barrels are passed from the smithy to the boring-shops, where the operation of boring (exclusive of rifling) is repeated no less than five distinct times. The barrels are for this purpose laid in horizontal machines, and

the first sized borer is drawn up through them, not forced down, as, from the bend of the boring bit in forcing it through, it was found difficult to secure strict accuracy. The second boring at swift speed is then continued, and the third at slow speed, by which time the barrel is finished to within some two or three thousandths of an inch of its proper diameter, when the exterior is turned down also to its service size. The operation, if such it may be called, of straightening the barrel is then gone through after the screw-hole for the breech-piece has been bored. This straightening is one of the roughest and most unsatisfactory portions of the whole process of manufacture. From the very fine soft nature of the iron used in the construction of the barrel, and the extreme thinness of the metal itself, the least violence or concussion is apt either to bend the barrel outright, or else to put such a dint in its side as effectually makes an end of its good shooting. Thus, in the processes which we have already described, in spite of the utmost care, the barrel is supposed to have deviated from its true line sufficiently to require considerable rectification. This rectification is done, therefore, not by machinery, but by hand, a workman looking through the barrel and giving it a tap here and a tap there with a hammer, wherever it seems to him to require it. In defence of this apparently very rude method, which seems so astounding in connexion with a bore that must be accurate to the thousandth part of an inch, the managers of the works point to the results achieved, and say that out of some 2,000 weapons made weekly the gauge of all is accurate to a half-hair breadth. This undoubtedly is true, but it is nevertheless very far from proving that such mathematical exactness is brought about by a man simply looking through the barrel and giving it a knock now and a knock then whenever he fancies he by sight detects an inequality in it. Most practical mechanics are of opinion that the process either does no good to the barrel at all, or that its result, if worth anything, would be better and more easily accomplished by machinery.

An immense variety of milling and grinding stages are next gone through, which merely relate to the exterior of the barrel, and with which, of course, we need not trouble ourselves here. A detailed account of the whole manufacture would be out of the question,

as our readers may easily imagine, when we say that the barrel undergoes no less than 66 distinct processes, and the whole rifle upwards of 700 ere it is completed. The barrel, then, having so far advanced in its progress towards completion as to be bored for the fourth time, it undergoes its first proof test of nearly one ounce of powder and one ball. Not one per cent. of the barrels yield under this trial, which has sometimes, in the case of doubtful barrels, or those which it was wished to burst, been carried to as high a charge as 2½ oz. of powder and 17 balls – the whole barrel full, in fact – before the metal ripped. After this the nipple-screw and nipple, with the “tang” or tongue which fastens the barrel to the stock, are made, though not a single piece is put together till the whole musket is complete to its minutest detail. Before the barrel leaves the boring-room it is again, bored out for the fifth time, and, having been polished by machinery inside and outside till it shines as bright as silver, it at last reaches its 56th stage of manufacture, and is taken to the finishing shop.

With the exception, perhaps, of the Laboratory at Woolwich, it would be difficult to name any factory room in the kingdom, not even excepting our largest cotton mills, which at the first glance presents such a bewildering scene of active, never-ceasing industry. Let our readers imagine, if they can, a single room more than an acre in extent, lofty and well lit, in which some thousand men and boys are incessantly employed in superintending machinery. The ear is pained by the hum of flywheels, which revolve in thousands till the eye is giddy with their whirl. Miles of shafting are spinning round mistily with a monotonous hum, the room is almost darkened and the view completely obscured by some 50,000 or 60,000 feet of broad flapping lathe-bands, which are driving no less than 600 distinct machines, all going together on their own allotted tasks, with a tremulous rapidity and ease that seem to swallow up the work like magic, and the first sight of which is inexpressibly astonishing to the spectator. It takes some minutes before the visitor can subdue the overwhelming feeling of surprise which this scene of activity always excites, no matter how often entered on. Following the barrel, then, but with care, into this maze of lathe-bands, we see the process of rifling first commenced. The rifling

in the Enfield barrel consists of three broad shallow grooves, with a pitch of half a turn in the length of the barrel of three feet six inches. The depth of the rifling is 0.005 at the muzzle, and 0.013 at the breech, the width of each groove being 3-16ths of an inch. There are 16 rifling machines at Enfield, each of which turns out 26 barrels a-day, though, of course, the grooves are made separately, and after the same fashion as in the boring – viz., drawn through the gun from the muzzle to the breech. Looking at the light through a newly-rifled barrel has an extraordinary effect, the rings of reflected rays showing like bars of black and white metal alternately; and by the aid of these, as it is said, the workmen are able to distinguish whether or not the tube is perfectly accurate.

After the rifling it is again proved with half an ounce of powder and a single ball; then it is retouched, sighted, trimmed-off, milled, levelled, browned, and gauged, coming out in the gauge-room at last a finished barrel, made to such perfection of accuracy that the steel gauge of 577 thousandths of an inch passes freely through, while that of 580 sticks firm in the muzzle. Browning, as we have said, is the last operation which the gun undergoes, and this merely ornamental process occupies a week more than the whole manufacture of the gun itself—namely, four weeks. The time thus bestowed, however, is not without its value, inasmuch as after the “browning” is completed, though not till then, the gaugers are enabled to detect the slightest imperfect welding or least perceptible flaw of manufacture, when the piece is instantly rejected, and the workman under whose hands the flaw took place fined 3s., no matter whether the imperfection is discovered at the very commencement of the process or when all is finished. The barrels thus flawed, we regret to say, are sold as old iron, but still in the form of finished barrels, and so doubtless find their way back again into the market as proved pieces. That this latter arrangement of selling the barrels complete, though as old iron, nothing can be more objectionable, and we are sure the War-office only require to have their attention drawn to the matter to secure for the future that all such pieces, before they are sold, shall be bent and flattened in such a manner as to be totally useless, at least for gun barrels, ever after.

But, as we intimated at the commencement of this article, the long processes by which the Enfield is brought to completion cannot easily be disposed of in a notice like the present. We defer, then, to a future occasion our description of the other portions of the manufacture and the peculiar weaknesses which render this weapon above all others so liable on slight occasions to irreparable injury.

### Part 2

**I**n the first article on this weapon we traced the manufacture of the most important portion, the barrel, up to its final completion, when the gauge is placed in its muzzle, and proves such a perfect mechanical fit that it remains bobbing up and down, according as the column of air in the tube yields or expands beneath the pressure. Will Birmingham, where all the anvils are now resounding with the manufacture of rifles for the Volunteer Corps, turn out a weapon as perfect in its gauge as that of Enfield? We can only hope so, for, if not, the Volunteers will be but poorly off when they come to be supplied with ammunition, made by the Government with the same care as to size as the barrel itself, and which should fit with almost the same nicety as the gauge we have mentioned. At Enfield everything is done by machinery, as we have already pointed out, and so each portion of the lock, stock, bayonet, and fittings of the gun is manufactured by the same kind of labour-saving machines as those employed upon the barrel. The part of the works devoted to this portion of the manufacture is filled with a peculiar and most ingenious modification of the pile-driving machine, where the weights are wound up by steam, and are ready for dropping again and again at the precise time required by the workmen in each stage. These weights punch out the hammers, lock-plates, springs, triggers, bands, and, in fact, every part of the gun or its fittings which is made either of iron or steel. After being thus roughly formed they are turned down to their exact size, according to gauge, and then case-hardened. This latter process is done by heating the parts to a dull red in a mixture of bone-dust (animal charcoal, in fact), so that the outside of the metal has all the hardness of the finest steel, while the centre retains the strength and

---

*The weak point of the Enfield rifle is exactly that part which ought to be the very best and strongest of the whole – viz., the barrel.*

---

toughness of wrought iron. The bayonet is, of course, manufactured at Enfield, with the other parts of the complete weapon, and nearly all the 68 processes which this piece undergoes are very interesting. Take it for all in all, no troops in the world are armed with such a strong, well-tempered, and efficient steel instrument of destruction as the bayonet which is issued to our troops. It is very much to be wished that the cavalry sabre at all approached it in either temper or strength, or that it had never been superseded by the cumbrous and inefficient sword-bayonet, which is only a bad and very heavy sword when off the rifle, and neither a sword nor a bayonet when on it. When the bayonets are first beaten out at Enfield they are as brittle as glass; they are then annealed in a slow fire, and become as soft as lead. While in this state they are subjected to the last chief process, that of tempering, which gives them that immense strength and spring which is found in no other weapon. The tempering is done by immersing all the blades in a bath of molten lead, which heats them to a dull red tint, when they are withdrawn and plunged into linseed oil, becoming then so hard again that the file makes no impression whatever. They are then again heated to a low temperature, and this perfects them as steel. A man then tests them as to their strength by striking them with the handles downwards over the edge of an anvil with all his force, after which they are forcibly bent backwards and forwards in a machine, and finally gauged. Those which have yielded under these ordeals, even to the very slightest degree, are rejected; the rest pass on to the grinding shop, where they are polished and finished off bright and keen as razors. The cost of each of these bayonets to the Government, even including interest and wear and tear of plant, is only 3s. 6d. They could scarcely be made elsewhere at any price whatever. In making the stocks of the rifles the machinery employed is about the best and

simplest that has ever been devised, and from the time that the rough beam of walnut-wood enters the row of machines at one end of the finishing-room till it comes forth at the other end a perfect stock, complete even to the most minute receptacles for the lock-work, the process occupies not quite 20 minutes. If there is any part of the manufacture in which a saving of time and labour might possibly be effected, it would certainly be in the gauging. Not only is every portion gauged in every process, but when all is done each is gauged and regauged again by half-a-dozen independent measurers one after the other. The result of all this is, that the very perfection of a mechanical fit is insured, and all parts, whether of stock, lock, or barrel, are interchangeable among all the Enfield rifles in the service. For the sake of this advantage alone, and exclusive of the undoubted superiority of manufacture, it would be well worth the while of Volunteer Corps to pay even a higher price in order to secure the Government rifle. The cost of each one to the Government is 2l. 5s., and they are produced at Enfield at the rate of 2,000 a-week. A perfect musket and bayonet are turned out there every two minutes, though from the time the processes commence with a single musket until it is finished, proved, and passed to store requires a period of seven weeks – of which, however, no less than four are occupied in “browning” the barrel. As with the manufacture of the Armstrong gun so with the Enfield, its rate of production is capable, at a short notice, of being extended to an almost unlimited amount by merely increasing the machinery employed in its manufacture. It swallowed up very much more than £200,000. to enable the Enfield works to produce the number they at present do weekly. Less than £80,000. expended in increasing the plant would now, however, give the existing factory the means of turning out 5,000 rifles a-week, while £80,000. in addition to this again would suffice for the production of nearly 10,000.

The weak point of the Enfield rifle is exactly that part which ought to be the very best and strongest of the whole – viz., the barrel. This, from important considerations as to lightness, and from the softness of the wrought metal itself, is too thin and too yielding to be subjected with safety to the rude chances of a campaign, unless the soldier is taught to be

particularly cautious as to its use. A very trifling injury as compared with that to which all other barrels are subjected with impunity is enough to dint and injure that of the Enfield to the most serious extent. Our readers must remember the large number of Enfield rifles which during the late campaigns in India were found to be inefficient from becoming suddenly too small at the muzzle to admit of the bullets entering. It was afterwards found that in some cases these defects arose from so slight a cause as the unequal thickness of the paper in which the bullet end of the cartridge is enclosed. This, however, was only the case in a few instances, the great source of injury, it was supposed, being the rough manner in which the soldiers “fixed bayonets” over the muzzle, or the careless manner in which the piece was handled with the bayonet on, – an almost imperceptible knock under such circumstances sufficing to dint the muzzle and prevent the entry of the bullet. Unless the most rigid caution is used, how much more likely are these injuries to occur among the weapons of Volunteer Corps, the muzzles of which, instead of carrying a 13-oz. bayonet, are all hampered with the so-called sword bayonet, weighing some three and a-half pounds! This latter cumbrous appendage, in addition to its thousand other disadvantages, has, when fixed in firing, a most serious effect on the accuracy of the bullet itself, over which it exercises nearly three times the amount of adverse influence that is attributed to the bayonet in the same position.

Two remedies have been proposed for doing away with this deficiency in strength of the Enfield barrel.

One method is to make it entirely of Whitworth’s homogeneous iron, and the other is a plan of Mr. Burton’s to make the barrel of steel. Each change would be a great improvement, the latter perhaps the greatest if there did not exist such difficulties in the way of welding on the “cone seat” after the barrel has been rough-made. Another mode of improving the barrel, by which all experience shows that an increase of range, and therefore of accuracy, could be gained, would be to alter the pitch or turn of the rifling. All firearms are rifled in order to insure a regular and steady flight of the projectile by giving it rotation round its axis of progression. The Enfield has only half a turn in the pitch of the rifling in the length of the whole barrel, and this, it is generally believed,

might be increased to one complete turn with the most favourable results. In the course of the many valuable experiments which Mr. Whitworth made as to the best pitch of rifling in order, in order to try the effect on the bullet of extreme velocity of rotation in the barrel he actually made one with one complete turn *in the inch*, – in fact, the inside of the barrel was a perfect screw. Yet this barrel, charged with 25 grains of powder, fired a perfectly fitting ball of lead and tin through seven inches of elm planks. The same gentleman, with a 24-pounder howitzer, having a hexagon bore, and, of course, a hexagon projectile on his own plan, fired with low charges shells of 10 diameters in length. With projectiles of a greater length than that of the common Enfield ball fired from the Enfield rifle, the bullet, no matter what its shape, always turns over within six feet from the muzzle of the piece, the rotatory force given by the slow turn in the barrel being insufficient to keep the conical ball point foremost. Mr. Whitworth proposes that all military barrels should be rifled with one turn in 20 inches, and even those most opposed to adopting so rapid a pitch consider that the present pitch of the Enfield might be increased with great advantage. The Whitworth rifle, on the principle of the hexagon bore and hexagon shot, and with the increased pitch we have mentioned, has in all Government trials that have yet been attempted beaten the Enfield both in accuracy and range, and of course, therefore, in penetration. It may, under these circumstances, be asked, why then is it that the Government have not adopted it and commenced its manufacture, especially as the present machinery at Enfield could be altered to suit the new plan of boring at a cost of not more than £50 or £100? On this point we are free to confess that we see no valid reason whatever why the Government have not adopted it. The excuses urged against the adoption are, first, that the Government having so lately incurred the expense of altering all the weapons in the army, from the “brown bess” to the Minie, and from the Minie to the Enfield, are not now prepared to meet the cost of altering them again, especially as during the next two or three months a breech-loading plan is likely to be adopted, which it is said may exercise a most important influence on the form and nature of the barrel to which it is applied.



# Long Range Shooting with the Military Muzzle Loading Rifle

David Minshall

The military muzzle loading rifle (MMLR) may not be the first rifle that springs to mind for long range shooting, yet within Great Britain its use goes back to the origins of the National Rifle Association. The Volunteer Movement established in Great Britain in 1859 was the catalyst for a great interest in rifle shooting and marksmanship skills. Significant factors in maintaining this interest were the formation of the National Rifle Association (NRA) late in 1859 and the sponsorship by Queen Victoria of a competition in the NRA Annual Rifle meeting first held in 1860.

The Volunteers were a military organisation and their arm of issue was the Pattern 1853 'Enfield' Rifle Musket. Both the Volunteers and the NRA held many competitions which were fired with this rifle, perhaps the most notable being the first stage of the Queen's Prize, with shooting out to 600 yards.

For many years the Muzzle Loaders Association of Great Britain (MLAGB) have continued this tradition of long range shooting with the Enfield rifle. Their match schedule includes National Rifle Championship matches at 200, 300, 500 and 600 yards. For those seeking a further challenge, the Long Range Rifles Branch (LRR) of the MLAGB Asquith Cup match is an aggregate fired at 600 and 800 yards with the Enfield.

Mention long range muzzle loading to most shooters today however and the classic .451 match rifle such as those by Whitworth, Henry, Gibbs and Rigby most likely come to mind.

For those accustomed to the management of the match rifle with all its finesse, the simplicity of the military muzzle loader will come as a joy. The careful cleaning between shots, the wads and paper patched bullets, and the studious attention to vernier adjustable sights can all be set aside. Anyone who shoots the Muzzle Loaders Associations International Committee (MLAIC) 100m Minie discipline has all the essentials necessary for a foray out to longer ranges. Powder, lubricated Minie bullets and percussion caps are all that's needed; once loaded, elevation is set on the rearsight slider, one makes an assessment of wind strength, aims off if necessary and fires. Simple!

Well, actually it's as simple as one wants to make it. So perhaps a review of typical equipment in use is called for.

The rifle most commonly used in MLAGB matches is the 'two band' Enfield. The Parker-Hale Pattern 1858 Naval Rifle is popular, as are original versions of this or similar Short Rifles. The common feature is the 33 inch barrel with 1 in 48 inch twist rifling.



*Original two and three band Enfields on the firing point.  
Note the difference in position of rearsights.  
That of the shorter two band Enfield (pictured left)  
is positioned further away from the shooter.*

## Long Range Military Muzzle Loader

The Pattern 1853 Rifle Musket is however seen on the ranges and can perform well. One attribute perhaps accounting for the popularity of the shorter rifle is the sights; the rearsight is placed four inches further away from the eye and this can enable the shooter to gain a clear picture of the sights. There are probably as many original rifles used in MLAGB competition as reproduction, and no distinction is made between them.

Grease grooved Minie bullets are in general use. Some shooters have experimented with paper patched bullets and there have also been those that have made the hollow nosed bullets which William Metford had competition success with in the early 1860s. Paper cartridges don't feature. Essentially there is no significant difference in loading between short range and long range. An increase in powder charge is generally made and to compensate for this some have modified base plugs on their bullet moulds to cast a thicker skirt on their Minie bullet.

Where the discipline really comes into its own is the ability to aim off to allow for wind. Sights are crude when compared to the match rifle, with just a simple slide for elevation and no windage adjustment. With the rainbow like trajectory of the typical 530-560 grain bullet, close attention to changing conditions is essential. Slight changes in head or tail winds and the bullet will drop short of or sail over the target. Point of aim may be several feet to the side of the target if the wind is strong; if one is lucky a clump of grass or other such feature in the butts may provide a point of reference.



*Muzzle loading Enfield rifle target shooting at 400 yard, today. The square targets used were those in use in the early 1860s by the NRA (UK). This is at Thorpe Cloud range in Derbyshire.*

MLAGB competitions are 3 sighting shoots and 10 match shots at all distances except 600 yards where there are 15 match shots. Targets used are the standard NRA(UK) type (and as used in the MLAIC Long Range World Championships for match rifle). All shooting is from the prone position with a two point military sling the only permitted support. Clothing is as per MLAIC disciplines.

One notable exception to the MLAGB competitions is a match run by the Nottinghamshire Rifle

Association in the picturesque Derbyshire Countryside (above). Shooting is on a square target as used in the early days of the NRA and distances fired at are 200, 300, and 400 yards. Course of fire is one warming shot, one fouling shot and five match shots at 200 yards, followed by one sighting shot and five match shots at each of the remaining distances. Shooting is from the prone position and no support (including a sling) is permitted.

On the national scene the NRA also hold long range matches for the Enfield in their Imperial Historic Arms Meeting (July) and the Trafalgar Meeting (October). A larger 'historic arms' target is used than in the MLAGB competitions.

This brief article has hopefully brought to the attention of shooters the greater possibilities of the military muzzle loader. Long range shooting with these rifles is a challenging discipline, frustrating at times yes, but also immensely satisfying. Beware it is also addictive! Give it a try.



# The Whitworth Rifle: A Brief Introduction

David Minshall

During the 1850s and 1860s the British service rifle calibre was .577, both for the muzzle-loading Enfield rifle and its breech-loading successor the Snider (a conversion of the Enfield). Early manufacture of the Enfield relied on much hand labour and consequently led to problems of inconsistent performance, non-interchangeability of parts and slow supply. Joseph Whitworth was approached to provide assistance with regards to the design of appropriate machinery for its manufacture.

Whitworth was the foremost manufacturer of machine tools of his time. Not content with considering the machinery for the manufacture of the rifle, he determined that a more appropriate course of action would be to establish that the proposed rifle was of optimum design before considering its mass production. In Whitworth's 1873 work, 'Guns and Steel', he writes:

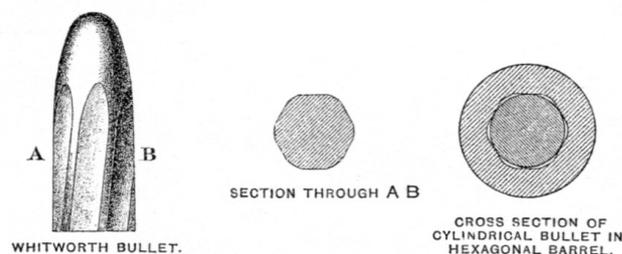
"IN the year 1854, when Lord Hardinge (the then Commander-in-Chief) was endeavouring to obtain the best possible rifle with which to arm the British troops, he requested me to aid him by investigating the mechanical principles applicable in the construction of an efficient weapon. I willingly agreed to do so, subject, however, to the condition that I should have a suitable gallery, protected from changes in the wind and from fluctuations in the atmosphere, wherein to carry on the experiments which were necessary for enabling me to arrive at any sound conclusion.

"It was absolutely essential to track the path of a rifle bullet throughout its entire course, to

determine whether its point preserved a true forward direction, and to record its trajectory. This could be done most readily in a closed gallery provided with screens of very light tissue paper.

"Accordingly a gallery, 500 yards in length, was erected in my grounds at Rusholme (Manchester), in the year 1855. Its height was 20 feet and width 16 feet; it was slated, and had openings on the south side only for the admission of light and for getting rid of the smoke."

The only design criteria Whitworth had was restriction to the service charge of 70 grains with a 530 grain weight bullet. The conclusion of his experiments was that the optimum bore for the charge and weight bullet specified would be .45 cal with a 1 in 20" twist to the rifling. Figures relating to the Enfield and Whitworth rifles are shown in Table 1 below.



Whitworth's rifling was a radical departure from that used on the current service rifles, being of hexagonal form and shooting a mechanically fitting bullet (see figure above). It should be noted that the polygonal rifling was not an original idea, having been previously considered by that great engineer, Isambard Brunel.

Rifle	Bore Dia.	Bullet Weight	Bullet Length	Rifling
Enfield (P.53)	.577	530 grains	1.81 diameters of the bore	1 in 72" twist
Whitworth	.45	530 grains	3 diameters of the bore	1 in 20" twist

Table 1

Despite trials which resulted in Whitworth's favour in some aspects, his rifle design was never adopted. The large bore service rifle continued in use until the Snider was replaced by the .45 calibre Martini-Henry in 1871. Whitworth somewhat acrimoniously summed up the development of the rifle in his 'Guns and Steel':

"The superiority of the Whitworth, as compared with the Enfield rifle, was first proved in a series of trials made at Hythe, in the year 1857, under the direction of Lord Panmure, then Minister of War.

"These trials led to no satisfactory conclusion, and after a lapse of eighteen months a Committee of Officers reported to the Government in 1859 that the bore of my rifle was too small for use as a military weapon.

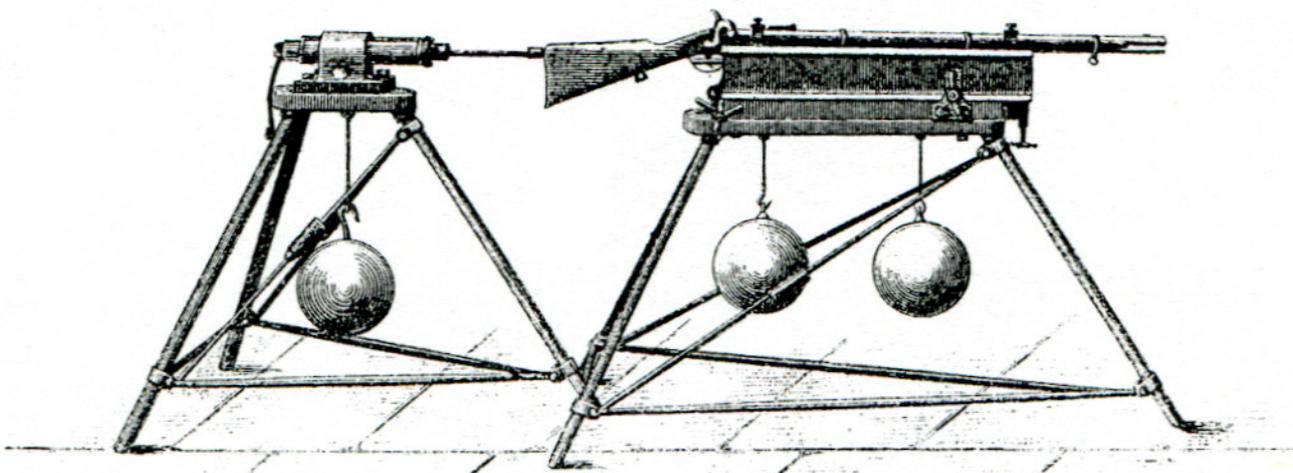
"Compare with this the report of another Committee of Officers made in 1862, "that the makers of every small-bore rifle, having any pretensions to special accuracy, have copied to the letter the three main elements of success adopted by Mr. Whitworth, viz., diameter of bore, degree of spiral, and large proportion of rifling surface."

"In 1869 a Special Committee reported to the War Office that the calibre of a breech-loading rifle, should be .45 inches, as appearing to be the most suitable for a military arm. This conclusion is directly contrary to that arrived at in 1859, but is the exact bore which I recommended in 1857."

While Whitworth may have missed out on a lucrative military contract, other events in the UK were to create a new market for his rifles.

During the late 1850's there was growing apprehension as to the prospects of French invasion of Great Britain. This culminated in 1859 with the Government issuing a circular authorising Lords Lieutenant to raise Volunteer corps. There was an immediate rush of Volunteering, but it was not expected to last. Measures to secure the long-term prospects for the Volunteers were, however, put in place late in 1859 with the formation of the National Rifle Association (NRA), its aims including "the encouragement of Volunteer Rifle Corps and the promotion of rifle shooting throughout Great Britain."

The first prize meeting of the NRA was held on Wimbledon common, where it was to remain an annual event until 1890 when it moved to the new ranges at Bisley. Queen Victoria fired the inaugural shot at the first rifle meeting on 2 July 1860. A Whitworth muzzle-loading rifle placed in a mechanical rest had been aligned with a target at a distance of 400 yards. Joseph Whitworth handed a silken cord attached to the trigger to Her Majesty and the rifle was discharged by a slight pull on the cord. The adjustment was so accurate that the bullet struck the target within 1.25 inches from the centre.



## The Whitworth Rifle



*A Whitworth military match rifle*

The Queen further offered encouragement by founding an annual prize that Volunteers competed for in two stages; the first at 300, 500 and 600 yards, and the second at 800, 900 and 1,000 yards. The first stage was shot using the long Enfield, this, however, was deemed of insufficient accuracy for the second stage. Trials were held at Hythe in May 1860 to select a suitable rifle. Joseph Whitworth and a deputation of Birmingham gun makers contested the trials, with the Whitworth rifle being the clear winner. With one exception (1865 when a Rigby rifle was issued), the Whitworth rifle continued to be issued to Queen's Prize finalists until 1871, when for the first time the match was shot throughout with breech-loaders. The Snider replaced the Enfield in the first stage, and the War Office made a special issue of Martini-Henry's for the second stage.

Following the principles established by Whitworth, gun makers developed a special class of 'small-bore' target rifle. The majority of these rifles were around .451 calibre, and the term 'small-bore' was used to distinguish them from the 'large-bore' service rifle of .577 calibre. Captain Heaton, in his 1864 'Notes on Rifle Shooting' describes a number of small-bore rifles: Baker, Beasley, Bissell, Crockart, Edge, Henry, Kerr, Lancaster, Newton, Parsons, Rigby, Turner and Whitworth. These are just a few of the gunmakers connected with the history of the small-bore rifle.

Although Volunteers using the service arm of issue carried out much of the shooting, other matches permitted the use of any rifle and were open to all-comers. It was here that the small-bore rifle came to the fore. Rifles used in these competitions evolved, during the decade of the 1860's, from variations of the military pattern to specialised items not suitable for military use.

Whitworth's military match rifle was introduced late in 1859 and this is the form used in the Queen's Prize final.

The classic form of the full match rifle was introduced by Whitworth in 1862. The full length military stock had reduced to a half stock (incorporating a 'pistol grip') and the ramrod was no longer attached to the rifle stock. These features allowed more weight to be concentrated in the barrel (the overall weight limit of the rifle being restricted to 10lb for NRA competitions). Open sights had been replaced with aperture sights taking interchangeable elements, and incorporating a spirit level to eliminate cant.

By the mid-1860s other gunmakers had developed rifling systems to rival Whitworth's, and his dominance on the rifle range was to wane.

The 1865 Cambridge Cup match in Great Britain, which comprised two days shooting at 1,000 and 1,100 yards, fifteen shots at each range each day, was won by Sir Henry Halford using a Gibbs-Metford match rifle. *The Times* of 15 June 1865 had this to say of the rifle: "The weapon with which the prize was won, will, it is said, create some stir among those interested in small-bore and long-range shooting, being on entirely new principles." Metford's design utilised shallow rifling and a hardened expanding cylindrical bullet.

In the same year, 1865, the Whitworth rifle was still enjoying popularity with the top riflemen of the time. In the Elcho Shield match seven of the English team used Whitworth rifles while one, Sir Henry Halford, used a Metford. The entire Scottish Eight used Whitworth rifles. Only the Irish Eight who were competing in this event for the first time differed, using the Rigby rifle. The latter is likely to be Rigby's deep rifling on the ratchet principle with mechanically fitting bullet; the extensive rebarrelling program not commencing until 1866.

With the undoubted successful introduction of the Gibbs-Metford in 1865, the period to c1870 marked the demise of the Whitworth rifle. Its deeply rifled hexagonal bore and mechanically fitting bullet was to be supplanted by the Metford and later Rigby rifles, with their shallow groove rifling and hardened lead bullets. It is noteworthy that the *Birmingham Daily Post* of Friday, 16 July 1869, carried the following report:

“It is a subject worthy of remark that the Whitworth rifle, which carried the palm for so many years, was not used by any competitor for the Elcho Challenge Shield. The shallow grooved rifling, and hardened, expanding cylindrical bullet, manufactured by Mr. Metford, and introduced into his patent rifle in 1865, is now universally adopted, and has entirely superseded all the deep-grooved rifles with their mechanically fitting bullets. As regards the Metford rifle, it ought to be known that although Mr. Metford is the inventor of the rifle that bears his name, Mr. Gibbs, of Bristol, is the sole manufacturer of it. It is simply known as the Metford rifle, and Mr. Metford is not a manufacturer.”

Whitworth did not patent the hexagonally bored rifle, rather a complete polygonal system for barrels and projectiles and method by which it could be made. From a system lacking in uniformity and based on ‘rule of thumb’ Whitworth created a system using precision engineering that would guarantee an accurate shot and stimulated the British gun trade into a period of experimentation and development.



*A Whitworth full match rifle with associated accessories. Rifle courtesy Dr. Ron Dillon Photograph by Fred Stutzenberger*

---

*Whitworth created a system using precision engineering that would guarantee an accurate shot and stimulated the British gun trade into a period of experimentation and development.*

---

# Hints for Long Range Riflemen

*Horatio Ross*

The Elcho Shield was first competed for by England and Scotland in 1862 during the National Rifle Association's Annual Rifle Meeting held on Wimbledon Common, Surrey, England. The match featured teams of eight shooters firing 15 shots each at 800, 900 and 1000 yards. In 1865 the match was expanded to include an Irish Team.

The Captain of the Scottish Team for many years was veteran rifleman Horatio Ross. His letters encouraging Scotsmen desirous of "becoming a first-class shot" were published in the press. That of 11 April 1864 gave hints "intended more for young men who have not as yet taken part in public competitions than for our old and experienced riflemen." This advice is still relevant today and worthy of reprint and study by the long range rifleman. Ross wrote:

*Source: The Scotsman, 14 April 1864*

Your first step should be to purchase a match rifle with all the modern improvements, and made by a first-rate gunmaker. I recommend you to practice chiefly with aperture sights, my experience having satisfied me that they have a great advantage over the old bead sight for target practice.

Buy a considerable quantity of powder of the number and manufacturers recommended by the maker of your rifle. Mix it and replace it in the canister. You will, by taking this trouble, be certain of shooting at all times with powder of equal strength.

Weigh every charge of powder carefully before going to the rifle range; for, unless you attend to this, your shooting will be irregular.

Keep very careful memoranda of your shooting, noting the point whence the wind blows, its strength, the state of the atmosphere, the light, and the height of the barometer.

Begin at 800 yards, and when you can command the bull's-eyes, note the elevation of your sight; and if the wind is blowing across the range, make a similar memorandum of the number of hundreds of an inch required by the wind-gauge to correct the lateral deviation.

Before leaving the first distance, fire a good many experimental shots, raising and lowering your elevation one-hundredth (100th) of an inch each shot, and making similar alterations on the wind gauge. Note particularly the effect of their alterations, as by doing so you will be able, when shooting in a match, to correct errors of elevation or of allowance for wind.

Go through the same process at 900 and 1000 yards, and occasionally practices at 1100 and 1200 yards, as nothing strengthens the eyesight more than shooting at very long ranges.

If you attend to these hints, you will in a few weeks have memoranda applicable to every description of weather, and will know before you fire a shot the elevation and allowance for wind which are required.

Horatio Ross

P.S. – In speaking of altering your sights by hundreds of an inch, I am calculating on your rifles being provided with Vernier's scales, without which it is impossible to make fine shooting.

---

Horatio Ross's fourth son, Edward, was the winner of the first Queens Prize match held at Wimbledon during the NRA's Annual Prize Meeting in 1860.



# First Hints on Rifle Shooting: Wind

*Alfred Paget Humphry*

Source: First Hints On Rifle Shooting by A.P. Humphry (William Clowes and Sons, London, 1876)

It is well to begin at once to contract the habit of noticing the direction and strength of the wind, and the indications of them afforded by flags, the smoke from rifles, the rustling of leaves, and other signs. The firer should be on the alert as to these the whole time he is on the range, and experience will teach more about the effect of wind upon the bullet, and the way to judge it, than all the books that could be written. At 600 yards the very gentlest perceptible wind will deflect the Snider bullet one or two feet, and in a gale it may be necessary to aim perhaps 18 feet off the target. The allowance required at 600 yards is quite half as much again as at 500 for the same wind. A wind blowing from the rear aids the bullet in its course, and tends to throw it over the target, while a head wind exercises a retarding, and hence depressing, influence.

As long as the wind remains steady there is no great difficulty in dealing with it, inasmuch as, after the allowance is once ascertained, nothing but steady shooting is required; but, when the wind so constantly changes its force and direction, that a fresh calculation has to be made before firing every shot, then it is that the skill of the rifleman is tested to the utmost, and he must give his whole mind to watching every change, and, if possible, its effects upon the shots of other firers. This watching of the results of other men, though often a source of much assistance, nevertheless requires the greatest discretion; in each case, unless the firer be a known and steady shot, his results are not worth taking into account, because it is impossible to tell how far the causes chiefly affecting them are external to himself. Indeed, in no case is it wise blindly to adapt one's judgment to the results obtained by other firers; such results should only be taken as means of calling the attention to conditions of the wind, which might otherwise have escaped notice, and no change of aim should be made unless the actual reason for it is clearly made out. If the advisability of a change is doubtful, it is better not to make it.

During the aim the attention must be sufficiently on the alert against a change of wind, which may at the last moment upset all the most careful calculations. Of course, with all precautions, a misfortune of this kind will sometimes surprise us at the moment of firing; nevertheless, much may be done to prevent it by not taking a longer aim than is absolutely needed, and by firing each shot, as far as possible, at a moment when the wind seems likely to hold firm.

Perhaps the most disappointing days for shooting are those on which the wind has not sufficient strength to lift the flags, but the atmosphere seems nevertheless lazily to swing to and fro. Before the firing, the apparent absence of wind gives every hope of brilliant shooting, but the uncertain manner in which the bullets strike first one side of the target and then the other, and the extreme difficulty of judging the right aim to be taken for each shot, soon induce a feeling of contentment with a very moderate performance.

Some ranges, from the conformation of the ground, or the proximity of trees or buildings, are subject to peculiar currents of wind. These are of course soon learnt by the habitué, but such experience is of little use for firing in other places. Undoubtedly it is a great advantage to have learnt to shoot upon a range situated in an open country, where the path of the bullet is neither unduly sheltered from the wind, nor exposed to any local diversion of its force. Knowledge acquired on such a range is useful everywhere, but a person whose practice has been confined to a range of the former sort can only possess a very distorted knowledge of the true effects of wind.

---

Alfred Paget Humphry (1850-1916) was the Queen's Prize Gold Medal winner in 1871 and represented Great Britain in the GB Rifle Volunteers vs US National Guard competitions of 1882 & 1883.



# Private McVittie

*John & Robert Hyslop*

*The following biographic sketch of Private Robert McVittie was extracted from 'Langholm As It Was', by John & Robert Hyslop (Hills & Co.: Sunderland, 1912). The engraving is from Harper's Weekly, 16 September 1882. That year McVittie was a member of the British team of Volunteers competing in the US, at Creedmoor, against a team of the American National Guard.*

**T**he name of Private McVittie of Langholm was for a quarter of a century known throughout the world as one of the most famous rifle-shots in the British Isles. He early distinguished himself with the rifle and won many important prizes at the various rifle meetings – Wimbledon, Altcar, Lanark and Edinburgh. As early as 1869 Private McVittie was selected as a member of the Scottish Twenty to shoot for Scotland in the International Matches. He was also for many years a member of the Scottish Eight, to compete against England and Ireland for the Elcho Shield. In 1876 he was one of the representatives of Scotland in the great Centennial matches at Creedmoor, New York when America, Scotland, Canada, Ireland and Australia competed for the Centennial Trophy in what was perhaps the most famous rifle-match in the history of long-range shooting. On the first day's shooting Scotland led, and McVittie was top scorer with a score of 209 out of a possible 225. This was the biggest score which had ever been made in a long-range rifle match, and the third largest score on record. In 1882, he was a member of Sir Henry Halford's team, representing Great Britain against America in the military breech-loading matches. His scoring on that occasion surpassed all records, and on the average of the aggregate scores, he was some four points ahead of his nearest competitor [*McVittie's score was actually 8 points ahead of the nearest American competitor, but he was however one point behind Major George Pearse, the top scoring British shooter. Editor.*]. It is an evidence of the reliance placed by the team captain's on McVittie's judgement, that he was invariable selected to lead of the firing, and from him the team received guidance as to windage and elevation.

During his various visits to America, the inventive



press of the country contained such apocryphal matter relating to the Border marksman, - interviews, which never happened, and photographs of him for which he never sat! One paper having described him as an "Englishman and the best shot in England" The Scottish American Journal, with national pride, at once corrected the statement, saying that "McVittie was not an Englishman, but a Scotsman, and the best shot in Great Britain". In 1885 the Volunteer Record took a plebiscite of its readers as to who was the best all-round shot in the shooting world, and McVittie headed the list by a tremendous majority.

In 1874 he won the St George's Vase and Dragon Cup at Wimbledon, with the highest possible score at 500 yards with a Snider Rifle. He also won the Bass, the Olympic, the Albert, and many other notable prizes. Albert Place, Langholm, was so named in commemoration of his success in the Albert Competition. In the famous Queen's Prize competition he was three times second for the silver medal, and has been third and fourth in the final stage, only losing the great prize, in 1881, with his last shot. By it he scored an outer, counting two, but had it been

an inner, which counted four, the 'Blue Ribband' would have been his. His successes are too numerous to mention here, but he won distinction with every rifle he tried. In the famous Wimbledon Ballads the following reference to McVittie is made :-

From near the Border-land comes Nestor sage,  
For skill, esteemed the wonder of the age,  
May heaven protect him and reward him still,  
Preserve his eye-sight and his snuff-box fill

During the period of which we write, the Langholm Volunteer Corps possessed not a few first class shots in addition to McVittie, and its fame was known throughout the country. The team embraced such veteran and cool shots as John Cowan, Samuel Hounam, James Bell, Thomas Wintroppe, George

Duncan, Gilbert Byers, C Weatherstone, Thomas Bell, Sergeant Pearson and his son Albert, Ackroyd Bowman, and others, who well maintained the honour of Langholm at the rifle-butts.

In 1886 Private McVittie produced a manual entitled "Hints and Advice on Rifle Shooting" which had a very large circulation both in this country and America. He emigrated to Canada in 1888, where he also distinguished himself at great rifle meetings.

*McVittie's "Hints and Advice on Rifle-Shooting" (ISBN 0 948216 12 3) was reprinted by: W.S. Curtis (Publishers) Limited*

*It is now out of print, although should still be easier to find in the second hand market than the original booklet.*



---

# Breech-Loading Small Arms

Westley Richards

## Introduction

Westley Richards' pamphlet "Loading at Breech, and Loading at Muzzle, For Military Weapons" was published by William Ridgway, London, in 1863. Much of the 80 pages discuss large calibre ordnance, however a portion of the text is given over to a discussion of small arms. One of the objects sought to be attained by Richards in publishing his pamphlet was:

"That a proportion of Breech-loading Muskets be distributed throughout the guards and Infantry of the Line, in order that the system may be thoroughly tested on Service, and the Government placed in possession of full information on the subject."

The British army at this time was still armed with the Enfield muzzle-loading rifle, although capping breech-loaders, including a carbine by Westley Richards, had been issued to some cavalry and dragoons.

It wasn't until 1864 that the British Government established a committee to "Report on the advisability of arming the infantry, either in whole or in part, with breech-loading arms." Subsequent trials led to the adoption of the breech loading Snider conversion of the Enfield rifle in 1866. This was replaced by the Martini-Henry in 1871.

The text overleaf is reproduced from Richards' pamphlet.

The advantages possessed by breech-loading over muzzle-loading in small arms are of scarcely less importance than in the large guns. Indeed, the only objection urged by military men against them is, "that the men would fire away their ammunition too quickly, considering the present means of supply in action." A man cannot of course fire away his ammunition too quickly, provided it can be supplied, and he fires with good aim, at a distance which enables him to do execution. In all other respects they admit breech-loading would be a vast improvement on the present clumsy mode of loading with a rod from the muzzle. Without venturing to give an opinion upon a military matter, there are certain facts relating to rifle-shooting which no practical man will question. No one will doubt the value of a low angle of elevation; it is admitted by all to be a thing of the first importance in a rifle, no matter for what purpose it is used. To strike an object with a rifle-ball, the first thing necessary is to make up your mind as to the distance of that object. To do that without a trial shot is a most difficult thing to accomplish, and the difficulties increase with the distance. When the effect of gravity can be overcome, and a ball got to travel in a straight line, then let soldiers fire at long ranges – not before, unless it is wished to throw away ammunition. Men who have attained the position of marksmen, should of course have long range sights on their rifles, and be trained to fire at long ranges. The next best thing to the straight line is the curve, which most nearly approaches it. I fear we must rest satisfied with this imperfect state of things, and content ourselves with what is only second best. All practical deer-stalkers know the difficulty of judging distances, and most appreciate those rifles which are least affected by errors of judgment in this respect; or, in other words, those, the bullets from which fly in the flattest curve, or, what is commonly called the lowest trajectory.

If all this assistance is admitted to be necessary to hit stags, or other wild animals, at distances varying from fifty to one hundred and fifty yards, and by the most practical rifle-shots in the kingdom, what can be expected of the average of such men as those of which our line regiments are composed? It is clear it can be little better than waste of ammunition to fire at moving objects at the long distances now thought

necessary. The first thing that would naturally occur to any one who knew much of the difficulties alluded to, would be to get his men as quickly as possible within certain effective range of the object desired to be hit by them; and the fact of a body of men constantly changing their position, would render them comparatively safe from the fire of an enemy – while they were advancing. This advance it would appear could be better and more quickly accomplished by never allowing the men to fire a shot till within such a distance that every shot would tell, – say 300 or 400 yards. If a rifle with only one fixed sight were used, having a very low trajectory, and if the men were taught to believe their rifles were of no value for firing beyond that distance, and were not allowed to fire except in volleys, a much more destructive effect would be produced, with a less expenditure of ammunition, even if a breech-loader were used. A certain number of the best shots as before mentioned would have sights to their rifles; these would no doubt be of great value for certain purposes. Suppose a given number of men to be armed with the present Enfield rifle, and to be ordered to advance on strange ground, where neither men nor officers knew the distances. If they were to begin firing at 750 yards, advancing and firing as quickly as they could, they will not put more than 6 shots to each man in a target, 6 ft. by 4, between the 750 and 300 yards, with an expenditure of 30 rounds of ammunition to each man, and they will put in 20 shots to each man, between the distance of 300 yards to 50 yards, with an expenditure of 24 rounds of ammunition. The time occupied in the advance from 750 to 50 yards, would be 37 minutes, more or less.

Take a like number of men, armed with good breech-loading rifles, having only one sight, as before described. Let these men advance as rapidly as they can from the same spot, without firing a shot till they get within 300 yards of the targets; let them then begin to fire, continuing to advance as they fire. They will put into the target 54 shots to each man with an expenditure of ammunition of 59 rounds, the time occupied in advancing the whole distance being 18 minutes.

The men selected for the experiment, from which the foregoing figures were taken, were all Volunteers

who had never before shot with a breech-loading rifle, but were, however, accustomed to the Enfield.

*Enfield Rifle* – Skirmishing in Line, Advancing, and Kneeling to fire, from 750 to 50 yards.

*Breech Loader* – Doubling down from 750 to 300 yards, then commencing firing and Advancing firing from the knee, from 300 yards to 50 yards.

	Enfield	Breech-Loader
Shots fired	54	59
Hits	26	54
Time occupied	37 minutes	18 minutes

With these facts before us, it is clear the difficulty of firing away ammunition may be overcome by some plan similar to the one alluded to, or may be met by arrangements for bringing forward an increased supply. If there are not more than two kinds of musket ammunition required, and those two kinds are totally distinct, in colour, shape, and general appearance, any man capable of distinguishing black from white, or round from square, could scarcely make a mistake between the two, and if he did, no harm could happen, as the cartridges themselves are so totally different, that they can only be used in the guns for which they are intended. A proper percentage of breech-loading ammunition, corresponding with the rifles in use, should be mixed with the service ammunition, so that wherever there was a supply of one kind there would be a supply of the other also. If the marksmen only of a regiment in the first instance, had breech-loading rifles given to them, there would be less chance of their wasting ammunition by useless firing, and any man found so doing, should at once be deprived of his marksman's rifle, and sent back to the muzzle loader: this would act as a salutary check, and help to make them careful with their ammunition. Giving a breech-loading rifle to a man when he became a marksman, would be holding out an inducement for them to attain that position. I think it would be found that the difficulty of two kinds of ammunition would disappear, if the proposed plan were adopted; the question can never be settled by – argument, when there is as much to be said on

one side as on the other, the only practical way of testing it, is to put it in practice; if there are found to be difficulties about it, we ought to learn to meet such an emergency, if we do not, an impassable barrier is raised against all future improvement; this should not be the case. The proper way it would appear of introducing a change of arms in the service (when there is already a good weapon as far as it goes), is to do it very gradually. When old arms are condemned as unfit for service, let them be replaced by the improved pattern; by this arrangement nothing would be lost. The old arms would be made to last their full time, and a good opportunity would be afforded for a practical trial of the new arm before committing ourselves too far.

There can be no doubt, in all other respects, as to the comparative value of the breech and muzzle-loaders. With the breech-loader, rather more than 2 shots to one can be fired as compared with the muzzle-loader; the soldier advances more rapidly, as he is not delayed by loading; and when loading, he is in a good position, both for self defence and rapid firing.

For skirmishers who could load lying down on the ground, there can be no question as to the value of breech-loading arms. There is also another advantage they possess: the projectiles can be hardened with a portion of tin, thereby increasing their power of penetration one-third over the ordinary lead bullets. The mixture of tin prevents the bullet from oxidizing, so as to be injured when it comes in contact with grease, which is a most important quality to possess.

With these apparent advantages, I think every one must admit it would be money well spent to have a few thousand infantry muskets on the breech-loading principle placed in the hands of our troops, so as to be ready for trial in active service at the first opportunity that presents itself. We should possess ourselves of information which could not fail to be of great value to us, at a small cost and it would help to settle an important question as to the value of a certain percentage of breech-loading arms for our line regiments. By making a small beginning, and increasing the quantity by degrees if found to answer, there would be less danger of a mistake being made, which is too often the case on a sudden call for any great change.

## *Breech-Loading Small Arms*

The present Enfield rifle, as well as the Armstrong gun, is the result of one of these sudden calls; each was the best arm that could be got at the time, and under the circumstances, when but little advance in long range shooting had been made, and when small bores of every description met with so much opposition. We now know it is not the best gun, though it is as good a military weapon as is possessed by any other nation, if not a better than any other. The best bore being now known, we might, after the new guns have had a sufficient trial, make the change by degrees, whenever the present rifles require to be replaced. The Government having, for military reasons, fixed 530 grains of lead as a maximum weight for their musket projectile, the proper bore is at once arrived at. It has been found by experience that the best shape for a projectile is about three diameters in length; it therefore follows that the bore of the musket should be about .450 inch, or a little under the half-inch. There are many ways of throwing a projectile, but there is only one right way, and that for long ranges is now ascertained. The question, of course, arises how long shall we be content with a weapon, which we know is not constructed on the best principles, and which is costing the country as much as one of a proper construction. I do not mean to say, that having got so good a weapon as the present Enfield rifle it is necessary to make any immediate change, but it is necessary to keep improving till the question is settled, a point we are approaching very rapidly in small arms; it would, therefore, be prudent before the demand arises, to get all the information it is possible to acquire, and be prepared for a gradual change being made. We shall not long be contented with anything that is second-best. The volunteer movement has turned the attention of a very intelligent portion of the community, both military and civil, to the subject of rifles and military weapons; with what success their achievements at Wimbledon and other places are the best practical answer; their knowledge of and their interest in the subject are increasing daily, as all who are in constant communication with them, or have occasion to talk to them on the subject, will bear witness. The comparisons made between the weapons of more perfect construction and the service weapon, are known to be anything but flattering to the latter.

If a question about the bore of the rifle at any time arises it is one that is sure to be taken up warmly, and by men who understand the subject they are talking about. This makes it all the more desirable that the small bore musket should have a proper trial, and I am glad to find that a number have been ordered by the Government for that purpose. When the best rifle for long distances has been obtained, it may be assumed that it is not far from the best one for short distances also. The soldier and the sportsman both require guns possessing the same qualities - low trajectory, accuracy, and great penetration. As to military weapons to be used for long ranges, I believe the most effective and the most economical arm would be a light one-pounder gun, to load at the breech, with the carriage so constructed that it could be put upon the back of a mule, or where the roads were good be drawn with its gun and ammunition. I know the late Lord Hardinge was always a great advocate for having a gun of this kind introduced into the service, and that he ordered one to be made at Enfield, when he was Master-General of the Ordnance. As this would be used by a small body of picked men commanded by artillery officers, there would be no fear of having ammunition thrown away uselessly; one gun might always be employed in getting the range; one hundred of these guns in position would be very formidable weapons, and from their lightness could be moved over any sort of ground, either on mules or on men's shoulders. The gun would weigh 70 lbs. and the carriage, and one hundred rounds of ammunition, about 170 more.

These would be easily carried on the backs of two mules.

The great difficulty of all light guns would appear to be the carriages, which if made light in proportion to the gun would soon be destroyed on rough ground, and if heavy it would do away, in a great measure, with the value of the gun, besides being liable to overturn from want of weight in the gun; this difficulty might be overcome by mounting it on a sort of saddle with wheels, or light carriage that would fit into a saddle; the gun might be so contrived that it could be fired from the shoulder, making the carriage serve as a recoil apparatus.



# Thomas Wilson: his Patents, Arms and Ammunition

*Andrew Appleby*

I live in Cape Town, South Africa, and am researching the little known Victorian Engineer, Thomas Wilson and his rifle systems. My aim is to write a definitive book on this man and provide some insight into his weapons system work conducted during the 1860's and later.

The book will cover certain key patent details including the development of his Capping-Breech-loading system for the conversion of Enfield muzzle loading rifles through to the development of a 0.50 calibre centre fire rifle and a further system identified as an integral forerunner in the design of machine guns and quick firing guns of today.

Detailed coverage of the numerous Army Trials and comparative information / statistics will be included, together with commentaries from users of the day to the inclusion of patent drawings, photographs, a data

list of the few remaining specimens that have been found and auction prices of his rifles from around the world over for the last 14 years.

The main objective of this book is to collate and concentrate the known information on Thomas Wilson and his breech-loading systems developed during the 1860's, a time when he and others were at the forefront of a transitional movement away from muzzle loading guns to full breech loading weapon systems.

Little is known about Thomas Wilson and even less on his weapon designs, as he and so many capable engineers of that time have been consigned to history and old bookshelves. Thankfully the internet and the digitising of thousands of books and newspapers has provided the author with a rich collection of snippets, allowing them to be brought together and placed with



*T. Wilson Patent No. 1318 (1859) Capping Breech-Loading Rifle*

his patents to give the reader some insight into his designs and understanding of the Wilson rifle systems. Included also will be the various trials and results presented by the Ordnance Select Committees to parliament in the search of a suitable breech-loading rifle to meet the needs of a modernising British Army.

Information has been sourced from around the world from, Auction Houses, Dealer Catalogues, Other Authors, Collectable Shops, Libraries, Museums and from Private Collections in an attempt to develop a common record from the scattered and piece meal scraps of information.

The second objective is to try and strike a balance between the academic weight of the book and the lighter moments derived from third party comments, likes and dislikes, to the simplicity of a hunter's daily diary in Africa recalling his use of his Wilson. Included will be magazine and the newspaper advertising of the day particularly those bringing new inventions and developments to their reader's notice.

The Auction information will provide the reader with some idea of international prices from country to country with the inclusion where possible of photographs of the individual auction pieces and descriptive write ups.

To ensure as much information is collected, I am looking for any contributions particularly examples of:

- Further information on Wilsons Carbines, Short Rifles, Long Rifles and Sporting Rifles.
- Photographs of such guns.
- Serial Numbers and prefix letters - found in front of the breech, also any cartouches to the woodwork etc.
- Newspaper / Magazine Advertising, Advertorial and Broad sheet Advertising particularly that of Rabone of Birmingham who were one of many licensed manufacturers.

If you can help with anything, please contact me directly at: [andrew.appleby@axxess.co.za](mailto:andrew.appleby@axxess.co.za)



*T. Wilson Patent No. 3211 (1867) Direct Bolt Action Centre Fire Rifle*

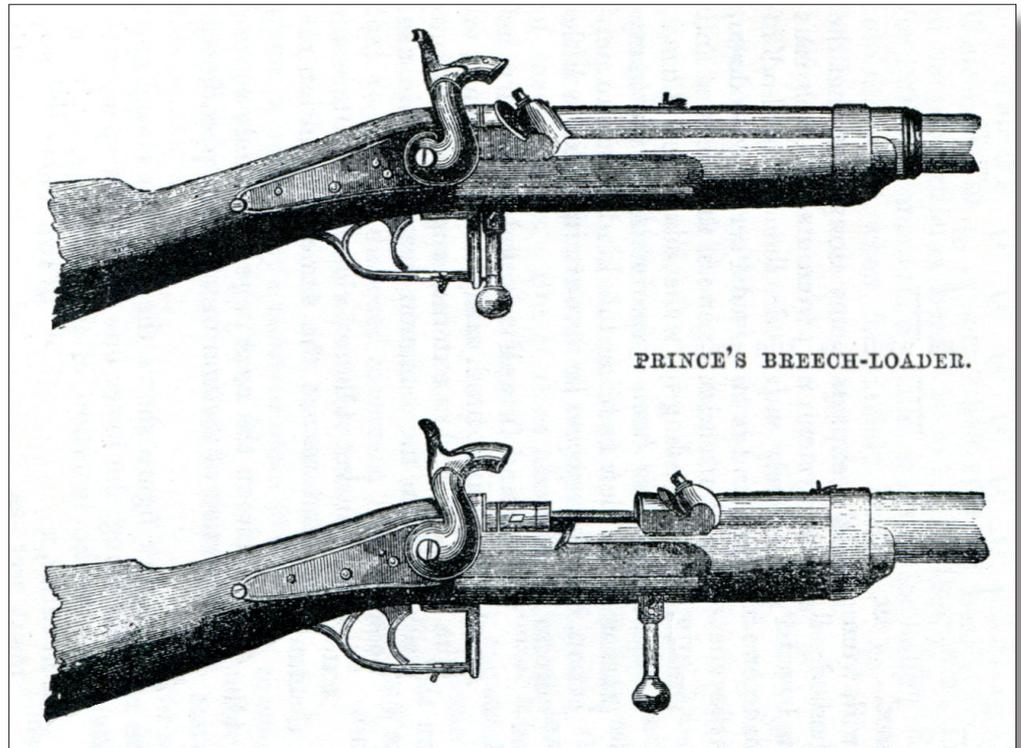


# Frederick Prince's Breech-Loading Rifle

Matthew Moss

In February 1855, London gunmaker Frederick Prince patented an unusual breech-loading system. Prince offered his rifle to the Board of Ordnance for testing where it outshot the then-standard Enfield 1853 Pattern rifle musket during trials at the School of Musketry at Hythe in 1855. However, the Board refused to consider adopting the new system believing it to be too complex and expensive to manufacture.

Prince's system used a sliding barrel to open up the breech to allow the loading of a paper cartridge, once the breech was closed the percussion lock was then capped. Once the hammer was brought back to full cock the rifle was ready to fire. In order to load the rifle the weapon was placed on half cock, the 'bolt handle' was then unlocked by pulling back the curved piece which protruded from the base of the trigger guard. The bolt handle was then turned slightly to the right disengaging the two lugs which locked the breech and then the bolt could be pushed down a short 'L' shaped channel. This pushed the barrel assembly forward, sliding on rollers inside the stock. This opened the breech allowing the rifleman to load a paper cartridge. Once loaded the bolt handle was pulled rearward again, and turned to the left again to re-engage the locking lugs. The bolt locking piece was then pushed back into a recess in the bolt handle to secure it. The bolt handle, along with the lugs inside the receiver, act to keep the breech block locked during firing.



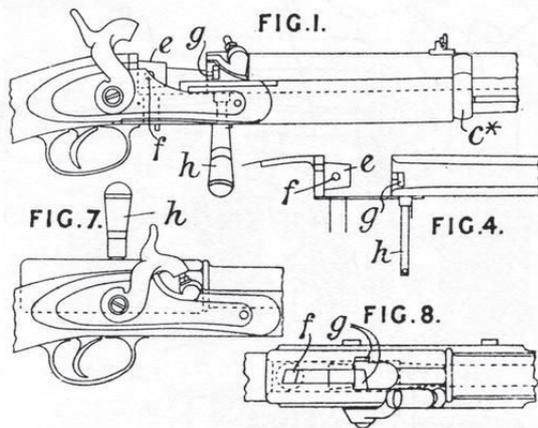
Pictured overleaf is Prince's original patent granted in 1855, it shows the 'bolt handle' positioned off to the side of the rifle's breech in the position we are more accustomed to seeing it. The handle still acts as a locking mechanism for the breech block and the system remains the same as seen in the rifle's built later. The patent also mentions the use of an interrupted screw thread to seal the breech and the possible use of rubber gas seals to prevent venting.

During the trials at Hythe Prince's rifle had been able to fire six rounds in just 46 seconds with 120 fired in just 18 minutes by Prince himself. Using a small bore version of the rifle Prince was able to demonstrate how accurate his rifle was putting 16 rounds onto a small piece of notepaper, a grouping of 1 3/4 inches, at a range of 100 yards while demonstrating it at the Victoria Regimental Practice Ground. The trials at Hythe saw it fired against the Enfield rifle musket where it put 48 out of 50 rounds on target at 300 yards compared to the Enfield's 47'. While Prince's rifle performed admirably the Board

## Prince's Rifle



386. Prince, F. Feb. 21.



*Breech actions, sliding-barrel.*—The standing-breech is fitted with a conical plug *e*, Figs. 1 and 4, having pins *f* adapted to engage with bayonet-joint slots *g* in the longitudinally-sliding barrel, and thus secure it in firing-position. The barrel is rotated and pushed forward to open the breech, being guided by spring bands *c\**. In lieu of the pins *f* and bayonet-joint slots, the handle may engage behind an inclined stop, or the plug and breech-opening may be formed with interrupted-screw threads. The plug *f* may be fitted with rubber gas-checks, and may be made hollow to receive the cartridge.

*Breech actions, sliding breech-block.*—The block has a projecting pin or pins engaging bayonet-slots in the standing breech. As shown in Figs. 7 and 8, one pin is formed as a handle *h*, which engages the part *g* of the slot when the breech is closed, and travels rearwardly to the position *f* as the breech is opened.

*Muzzle-loading.*—The sliding-barrel arrangement described above may be adapted to muzzle-loading guns, the barrel being permanently secured in the rearward position.

of Ordnance refused to order a batch for further testing, perhaps feeling his system was too complex or too expensive to manufacture, or perhaps not robust enough for military service. Another important factor to consider is that in 1855, while the Board of Ordnance continued to trial guns the British Army had just two years earlier formally adopted the 1853 Pattern rifle musket and was in the process of manufacturing these<sup>2</sup>. Prince's patent is undeniably an ingenious breech-loading system. It is a testament to the belief in the design that in 1859, four years after it had first been rejected, a group of prominent London gun makers including Manton, Wilkinson, Samuel Nock, Parker Field, and Tatham petitioned the Board of Ordnance to reconsider their decision<sup>3</sup>.

While rare there are a number of examples which survive today which indicate Prince's Patent rifles were produced by a series of different British gunmakers including Prince's own company Prince & Green, Wilkinson's, E.M. Reilly and Isaac Hollis & Sons. The rifles tend to have barrel lengths of between 25 and 31 inches and most have either three or five groove rifling. The rifles were made in various calibres from the British army's standard issue .577 to much smaller rook and rabbit hunting guns in .24 and .37 calibre. Other calibres include .500 and .90 inch bores. With the variety of makers the sights, stocks and fittings found on the rifles vary greatly from simple dovetailed leaf rear sights to more complex ladder sight with one example even having a series of folding aperture sights.

The example pictured was manufactured by Wilkinson of London (who later became Wilkinson Sword). It is marked with the serial number 'X.16' on the receiver and had 'Prince's Patent' engraved on

the action. It was possibly manufactured in the mid 1860s as it is marked simply 'Wilkinson' rather than Wilkinson's & Son as it had been until 1861, when Henry Wilkinson died and left the company to John Latham<sup>4</sup>. This example was one of the many Prince's Patent rifles made for civilian sporting and target use.

In refusing to adopt Prince's breech-loading system it can be argued that Britain lost an opportunity. The system was undoubtedly fast and accurate in action. However, the Prince rifle was a single victim of a wider trend between 1842 and 1865, the British Army and Board of Ordnance examined and trialled dozens of breech-loading rifles but did not feel it necessary to adopt one until they had been overwhelmingly proven in the field<sup>5</sup>.

In early 1864, the armies of Europe were shocked by the decisive victory the Prussian Dreyse Needle Guns brought during the Danish-Prussian War. In 1865 the British began to seriously look for a breech-loading replacement of their Enfield 1853 Pattern rifle muskets<sup>6</sup>. Following trials of various submitted designs Jacob Snider's cartridge conversion was selected and in September 1866 the Snider rifle was introduced becoming Britain's first breech-loading military rifle.

### Notes

1. H. Busk, *The Rifle and How to Use It*, (1861), p.116
2. H.L. Blackmore, *British Military Firearms 1650-1850*, (1961), p. 233
3. R.J. Wilkinson-Latham, *Prince's Carbines*, *Gun's Review*, Nov. 1971, p.441
4. *A Brief History of Wilkinson Sword*: [www.wilkinsonfscollection.com/wilkinsonfscollection.com/Wilkinson\\_a\\_brief\\_history.html](http://www.wilkinsonfscollection.com/wilkinsonfscollection.com/Wilkinson_a_brief_history.html)
5. P. Smithurst, *Pattern 1853 Enfield Rifle*, (2011), p. 10
6. S. Manning, *The Martini-Henry Rifle*, (2013), p. 4

### Acknowledgements

- Photographs courtesy of Chuck Kramer of [www.gunlab.net](http://www.gunlab.net)
- Thanks also to [www.researchpress.co.uk](http://www.researchpress.co.uk) for their assistance in finding Prince's patent

*Matthew Moss is a military historian specialising in the development and use of small arms, he writes freelance for numerous publications and is the founder and editor of [www.historicalfirearms.info](http://www.historicalfirearms.info)*



*Prince's Rifle*





*Prince's Rifle*



**Muzzle Loaders  
Association of Great Britain**



*The MLAGB was formed in 1952 and is the Governing Body for muzzle loading within the UK.*

*Its objectives are to encourage an interest in muzzle loading firearms, to promote, regulate and safeguard their use and to preserve their freedom of collection.*

*[www.mlagb.com](http://www.mlagb.com)*

**Historical Breechloading  
Smallarms Association**



*The HBSA was founded in 1973. The fundamental aims of the HBSA are to encourage the Preservation of Historic and Heritage Breechloading firearms and to foster the research and study of all aspects of the subject, from the aesthetics of sporting guns and the engraver's art to the functional aspects of firearms used by the soldier, target shooter and the sporting shooter.*

*[www.hbsa-uk.org](http://www.hbsa-uk.org)*

**Long Range Black Powder Rifle  
Target Shooting**



Long range target shooting with the percussion muzzle loading rifle and black powder cartridge rifle.

Historical study and shooting today.

19th Century competition at Wimbledon, Creedmoor and Dollymount. The rifles, ammunition and equipment, riflemen and gunmakers.

[www.facebook.com/groups/researchpress](http://www.facebook.com/groups/researchpress)

# Advertising

Contact Research Press

for

Competitive Advertising Rates

[journal@researchpress.co.uk](mailto:journal@researchpress.co.uk)

David Minshall

# World Super Shoot

## PHOENIX: 2018

Ben Avery Shooting Facility

March 5-6-7

March 8- 11



### USIMLT National Championship

Day 1: 300-500-600 yards  
Day 2: 900-1000 yards  
Day 3: 1000-yd. Fun Team Event

~ We provide target pullers ~

First Class Trophies & Awards for  
Muzzleloaders, Cartridge Rifles, Vintage  
Sniper Rifles, and Bench Shooters

Complete details at:  
**USIMLT.ORG**

Contact: Ray Hanson  
TwinValleyHansons@icloud.com



### 1000-yd. Championship

Black Powder  
Cartridge &  
Vintage Snipers

A Special Long Range Black Powder  
Target Rifle Match to establish the

**WORLD'S BEST**  
Long Range BPTR, VSR,  
and BPML Shooters

Complete details at:  
**ArizonaVintageRifle.com**

Contact: Tim Thorne - (240) 994-3424  
TimNoriThorne@msn.com

**6 Days  
of Continuous  
Black Powder  
Shooting at  
2 Separate Events!**

