

covering the most accurate long-range arm wherewith to shoot the second stage of the Queen's Prize, had hitherto resulted in walks over by the Whitworth, but this year six competitors put in an appearance. Still the trial resulted in the Whitworth proving its superiority. It may be here remarked that the rifle submitted by Mr. J. Rigby, of Dublin, had ratchet-shaped grooves, and fired a cylindrical bullet. The leading small-bore prizes at the meeting fell to the Whitworth, the Henry rifle taking the next place.

1863.

Nothing remarkable took place this year, the Whitworth rifle still keeping to the front.

1864.

At the N.R.A. meetings of 1864 the position of the Whitworth rifle was unchanged; but at the preliminary trial of rifles early in the season Mr. Rigby succeeded in tying the Whitworth upon the figure of merit obtained by the shooting of six rifles fired from the machine rest at 1000 yards range, a series of twenty shots being fired from each rifle, the mean deviation for both kinds of rifles being 1·83ft. Mr. Rigby had, however, laid aside during the previous season his cylindrical bullet, and had adopted a hard mechanically-fitting one, and also a different plan of rifling, offering, as it were, five ridges to the hold of the bullet. He had obtained some very good results in firing these rifles from my *Field* machine rest\* (similar, in most respects, to the rest

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\* This rest was devised by me in order to meet the objections made by several of Mr. Henry's friends and others to Mr. Whitworth's sliding rest, which, they alleged, was capable of manipulation by the sergeant in charge of it, either in favour of or against a competitor, by pressing on the butt of the rifle, and thus altering the line of aim. In those days, in the course of the twenty shots made for "figure of merit," a considerable fall took place towards the end owing to the fouling which accumulated in the grooves, and this, it was stated,

shown opposite p. 46, Vol. I.), so much so that at a subsequent trial in the autumn of this year he took the first place, and consequently obtained the order to supply the rifles to be used by the "sixty" in the "second stage Queen's" of the ensuing year.

1865.

In the June of this year a trial of twenty of Mr. Rigby's rifles took place at Enfield. The shooting generally was very good, and one rifle gave a group of twenty shots at 1000 yards with a mean deviation of 1.11ft. only—a figure of merit never before reached by any rifle in a public trial. At the N.R.A. Meeting the shooting obtained by these rifles in the Queen's Prize was of a superior character to any hitherto obtained in this competition. The Whitworth rifle, however, still retained a prominent position in all competitions not restricted to the Enfield. The Metford plan of rifling first appeared at this meeting, Sir H. Halford using it in the Elcho Shield match. This weapon, destined to become a favourite arm for high-class long range shooting, was distinguished from its leading rivals by its designer having altogether abandoned the fitting projectile introduced by Sir J. Whitworth, and imitated in principle by nearly all the leading rifle makers. Mr. Metford took the smooth cylindrical bullet, such as was used by Mr. Henry, Mr. Ingram, and by Mr. Rigby in 1862, and, by making it of a hardened alloy (similiar to that adopted by Whitworth for his fitting projectiles, or perhaps not quite so hard) found that he could obtain fine results with it when fired from a barrel having its rifling groove of the same or even a less depth than that of the shallowest portion of the Enfield cut.

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could be counteracted by depressing the butt, which was held by the shoulder of the sergeant. My rest, on the contrary, was backed up by a spring (as it still is), and is therefore incapable of being tampered with. Having been present at all the early competitions held at Woolwich, my suspicions were certainly aroused, but I never had reason to believe that the great superiority shown by the Whitworth rifle up to 1864 was mainly due to this cause.

He further incorporated into his system the American plan of the increasing spiral, as Lancaster had endeavoured to do since 1852; and by further availing himself of every technical detail likely to prove of value, and insisting upon a high standard of workmanship, he was able to produce some very fine results, though doubtless a great portion of the success of the Metford rifling must be ascribed to the great improvement in the quality of the gunpowder used since 1854, when it was so imperfect that Sir J. Whitworth dare not rely upon it for any upset or expansion of the solid projectile he proposed to use.

1866.

Though the long ranges of the Queen's prize were shot with the Whitworth, a marked advance by the Metford rifle can be observed in the "Any rifle" competitions, and from this year may be dated the overthrow of rifles using fitting projectiles that obviously could not be used with breech-loaders, and, no doubt, if this type of projectile had continued longer in use, the advent of the B.L. rifle as an accurate long range arm would have been proportionately delayed.

1867.

This year Mr. Rigby introduced his model long range rifle, for which, in its essential features, he had adopted the lines that had guided Mr. Metford, as before stated, so much so as to cause some to consider Rigby as rather overlapping Metford in several respects. This is a matter I cannot undertake to discuss, but my readers will, no doubt, be able to arrive at their own conclusions upon the matter. These two rifles as M.L.'s will be found to have divided between them the larger proportion of the patronage and esteem of the long range shots of the country, and most deservedly so. This year may be considered as the starting point of the modern B.L. rifle, that is a rifle using metallic cartridges, carrying

their own ignition as opposed to the earlier type of B.L. using consuming cartridges, and requiring a cap to be used with each discharge precisely as with a M.L. rifle. For the last seven years this latter style of B.L. rifles had been familiarly known at Wimbledon and similar gatherings; especially had the Westley Richard's "capping" B.L. distinguished itself by winning year after year the special prize for B.L. rifles given by the Duke of Cambridge, though the shooting made, as a rule, would not bear comparison with the contemporary shooting of the M.L. rifle now rapidly approaching perfection. One of the most successful of the new model B.L. rifles, introduced by Mr. Henry, now came decidedly to the front, and, as far as barrel and projectile, and to a certain extent, indeed, the entire weapon, was the precursor of the same details now embodied in the present service rifle, the Martini-Henry. The breech action adopted by Mr. Henry was, however, but a modification of the older and well-known American breech, known as "Sharp's," but somewhat re-modelled and adapted to the new conditions of cartridge, &c.

## 1868

Is only noticeable for the continued success of the shallow-grooved cylindrical bullet M.L. rifles as against the older models. A number of B.L. rifles alike in most details affecting the shooting, but of differing mechanical arrangements in their breech actions, now appear, but no distinct advance can be recorded.

## 1869.

The investigations of the Government Committee on small arms, whose labours terminated in the selection of the Martini-Henry rifle as the service arm, caused a great impulse to be given to that class of rifle shooting, known as M.B.L. work, though at this period rapidity of fire was considered as well as accuracy; the "Henry" barrel and ammunition being



decidedly in the front. The "Any rifle" class of shooting calls for no remark, only that both the weapons and the shooters were steadily advancing to a high pitch of perfection. The Whitworth rifle was now nearly confined to the second stage Queen's prizes, scarcely appearing in the open competitions for small-bore rifles.

### 1870.

The newly adopted service arm, the M.H. rifle, comes to the front this year, the Duke of Cambridge's prize being won with one of these; though it should be noted that, up to and including this year, since 1863, the extreme range in this important competition has been only 800 yards, and the number of shots fired not exceeding seven, though the rifles used were supposed to previously qualify for rapidity and accuracy combined in a "time limit" shoot at shorter ranges. Nothing worthy of remark occurs affecting the fine M.L. rifles.

### 1871.

This year two new rifles were officially introduced to the rifle world. The Snider-Enfield B.L. replacing the Enfield M.L. arm, and the Government pattern Martini-Henry B.L. replacing the Whitworth M.L. in the second stage Queen's prizes, shot at 800, 900, and 1000 yards; thus M.L. rifles were swept away from the Wimbledon meeting in all but the fine long range "Any" rifles. The M.H., in all its essential features, had now settled to very nearly its present model. During its previous appearances at Wimbledon the rifle was heavier, chiefly in the barrel, and the long taper .450 Boxer-Henry cartridge was used with it instead of the present pattern .577-.450 bottled shape. The Metford barrel first appeared as a B.L. rifle at this meeting, and in combination with a falling block breech action of Westley Richards (on somewhat similar lines to the Martini breech), succeeded in taking the

Duke's prize, now for the first time shot for at the 1000 yards range, and hence justly considered the "blue ribbon" of the M.B.L. rifle at Wimbledon.

1872.

While the M.L. "Any" rifle continued in its finely developed form, some advance was made this year by the M.B.L. class of rifle—so much so as to cause a match to be shot between teams of five on each side, one armed with M.L. rifles, and the other with B.L. rifles, fitted with similar fine sights, &c., as used on the muzzle loaders. The conditions of the match were 30 shots per man at 1000yds. range. The M.L. team won easily, with a majority of 15 points per man over the scores made by their opponents, the shooting of these latter being of an exceedingly moderate character; four of these B.L. rifles had Metford barrels, and the other a Henry barrel. The "Duke's" was again won by a Metford-Westley-Richards, though a Henry rifle tied with the top scorer, and this latter rifle was very successful in the M.B.L. competitions now established, in which accuracy of fire alone was considered. As an illustration of the fine work the M.L. rifle was now capable of, Mr. E. Ross this year won the "Any rifle" Wimbledon Cup with a Metford rifle, the conditions being seven shots each at 600 and 1000 yards: he made all bullseyes at both distances.

1873.

The N.R.A. at this meeting gave a special series of prizes (the "Arthur") for the encouragement of B.L. "Any" rifles, the conditions being ten shots at 600yds., the B.L. not being considered as capable of fine work beyond this range. The majority of the prizes were won by the Swinburn and Henry rifles, the first prize being taken with one of the former weapons firing the Government M.H. cartridges, but with a barrel somewhat improved in the detail of the grooving as

compared with the Henry barrel. Both these rifles were rather conspicuous in the open M.B.L. competitions, the latter securing the "Duke's" once more, the Metford W.R. being but moderately prominent in the prize lists among the B.L.'s. The perfection attained by the M.L. rifles calls for no remark this year.

### 1874.

The interesting competition for B.L. "Any" rifles at 600 yards, introduced last year, was this time won with a Metford rifle, after shooting a tie against a Swinburn. In the M.B.L. competitions the latter rifle, together with the Henry, still take the lead, though the "Duke's" was taken by a Metford B.L. with a score one point higher than that made by a Swinburn rifle with an Ingram barrel firing the Government M.H. cartridges. The breech action now used with the Metford barrel is the one invented by Mr. Farquharson and described in a succeeding chapter of this volume. This year may be considered to be nearly, if not quite, the climax of the success of the "Any" M.L. rifle as used for match and competitive shooting. In the autumn of this year took place the celebrated rifle match at Creedmoor, New York, between the Irish team, armed with Rigby M.L. and the American team armed with B.L. rifles of home manufacture, resulting in a defeat of the former by three marks only. The B.L. rifle used by the winners was of such a highly artificial and delicate construction that the barrel required to be elaborately wiped out perfectly clean between the shots, and only by strict attention was it enabled to overcome the M.L. rifle, which, of course, was fired continuously, though the scoring made by the latter rifles was fully up to the then best recorded work.

### 1875

The "Duke's" was again taken by a Metford rifle with a score one point higher than that of the second man who shot

with a Henry—this latter rifle securing the first prize in the “Arthur,” now a M.B.L. shoot; while the Swinburn took the first place in the “Secretary of State for War’s” prizes, shot for at 900 yards. In general the M.B.L. prizes were pretty evenly divided among the three rifles mentioned. This year is memorable for the first appearance at Wimbledon of a small body of rifleman from the United States with their “Any” B.L. rifles on the swabbing out principle previously alluded to. Their shooting, though interesting, did not produce any immediately marked impression, though, by their again having defeated the Irish riflemen in the return match at Dublin, they had unquestionably proved the superiority (at least for mere target work) of their breechloader, used with a heavy charge of slow burning powder, and thoroughly wiped out after each shot, over our M.L. rifle, fired continuously without any other cleaning process than that effected by the well fitting wad passing down the barrel in the act of loading. From about this time British riflemen began to experiment first upon their M.L. rifles, carefully wiping them out between shots, and, farther, with B.L. rifles constructed on similar lines to those of the Americans (rifles of American manufacture being imported for the purpose), but for some time only modified success attended these experiments, as the powder in general use in this country was too rapid in its combustion to permit of the good points in this plan coming fairly out. In time this difficulty was of course got over, and a suitable powder manufactured. Another feature largely adopted from the American riflemen was that of using the “back” position in firing, though this position could not be considered a novelty upon Wimbledon common, as a few noted shots had fired in it for many years; still, the great success of the Americans in their matches attracted attention to its undoubted advantages, especially for long range work. A fine range

score for this period was made in the Elcho Shield Match by Mr. Boyd, with an Ingram rifle M.L., at 1000 yards—he made in his fifteen shots, two magpies and thirteen bullseyes, finishing with eleven of the latter consecutively.

1876.

The performances of the "Any" rifle at the Wimbledon meeting of this year require no comment, except that the Great International Rifle Match took place at Creedmoor, New York. The match was contested by teams of eight men each from Ireland, Scotland, Australia, and Canada, with, of course, a United States team. The last-named won the match, which extended over two days, and was competed for under the usual Elcho Shield conditions. The Irish team came in a close second, still using the Rigby M.L. rifles. The remarkably fine shooting of a member of this team, Mr. J. K. Millner, at the 1000 yards range, is worth noting, it having never yet been equalled. Upon the second day of the match he made fifteen consecutive bullseyes at this distance, being the highest possible score; and, in a ten shot match a few days afterwards, he made ten consecutive bullseyes, thus again making the highest possible score. The "Duke's" was well won this year by the Metford B.L. rifle, no other weapon coming within four points of the winner's score, and a decided advance was made by the same rifle in the number of prizes won in the other M.B.L. competitions, more particularly in the "Sec. of State for War" and the "Henry," shot at 900 and 1000 yards respectively. In the shorter range competitions the other M.B.L. were more conspicuous.

1877.

The shooting of the winning team in the Elcho Shield match was this year exceptionally fine, they were armed (with one exception) with Rigby M.L. Rifles. Another important

any rifle contest took place this year in the United States; and a team composed of riflemen selected from among the best shots of Great Britain and Ireland, tried conclusions with the Americans, and some fine shooting took place; but the visitors were beaten by a larger number of points than in any previous International match. There was now no doubt that the American cleaning-out system enabled breechloading rifles, so constructed as to suit this mode of treatment (and, indeed, to be useless without it), to give more accurate results in long range match firing than could be obtained from M.L. rifles. The B.L. competitions were largely won with Metford rifles—in fact, all the first prizes at the long ranges, except one at 800 yards, fell to this weapon.

## 1878.

This year the B.L. "Any" rifle began to make itself felt in the competitions established for these weapons, several leading riflemen using either imported American rifles or home-made weapons worked on the same plan; but in the Elcho Shield match the Irish team, all but one using the Rigby M.L., were again victorious with still more splendid scoring than that of the previous year. In this shoot is to be found the highest individual and collective scores ever made with the M.L. rifle in this country. It may be worth while to note that the habit of wiping out the M.L. rifle between the shots, now introduced in imitation of the American plan, no doubt contributed in some degree to these fine results.

In the M.B.L. competitions the superiority of the Metford rifle over the other types of B.L. rifles continued, though occasionally prizes were taken by the Henry and others.

## 1879.

Among the "Any" rifles at Wimbledon this year, the American rifles and their imitators showed increased promi-

nence in the prize lists, no less than three of the former weapons being used among the English "Eight" and the "Albert"—the most important prize for this class of rifle was won for the first time by an American. In the M.B.L. shooting the Metford rifle was again very successful; but other rifles began to put in an appearance, among these the most noticeable are the Webley-Wyley and the Fraser, both described in a following chapter.

1880.

The M.L. "Any" rifle may be considered to be completely overpowered this year by the new style of manipulating the breechloader introduced by the Americans; and these latter show in the competitions open to them that, from some cause or other, the British B.L. rifles on their plan are unable at present to cope with them, nearly all the leading prizes for "Any" rifles falling to users of these weapons. However, the remarkably brilliant scoring of the Irish team in the Elcho Shield Match (all but one being armed with Rigby B.L. rifles on the American plan) shows conclusively that we were not far behind them in the dubious merit of producing such a useless type of weapon. The aggregate score of the Irish team upon this occasion is no less than 28 points in excess of their fine M.L. score in 1878. In the M.B.L. competitions the Metford rifle takes a prominent position, a sprinkling of prizes falling to the other rifles. Perhaps it is proper here to call attention to the almost total absence from the long range prize lists of the Government pattern Martini-Henry, and rifles carrying similar ammunition; this peculiarity may be noticed in the N.R.A. reports for the last few years, and is in itself most suggestive of the value of this class of weapon for accuracy of fire at the extreme ranges.

1881.

Again this year were the leading prizes in the "Any" rifle competitions taken by American rifles. In the M.B.L. competitions the Metford rifle met with a more qualified share of success than had fallen to its share during the few preceding years. For the first time since 1873 it failed to secure the Duke of Cambridge's prize, which fell to a Webley-Wyley rifle, the same weapon securing the first prize in the "Sec. of State for War" competition, shot for at 900 yards. In that important long range shoot, the "Bass," the first prize was secured by a "Fraser" rifle.

1882.

Though several leading prizes in the "Any" rifle shoots fell to American rifles, they were not so sweeping in their success as in the two previous years, probably owing to the fact that no visitors from the U.S.A. attended Wimbledon this year. In the M.B.L. competitions the Metford rifles retrieved their reputation, winning the first prize in every shoot, a proportion of the other prizes only falling to other rifles. This year took place the great International match between teams of British volunteers and U.S.A. National Guard. The match took place at Creedmoor, New York, and, either on account of our superior rifles or the superior shooting ability of our representatives, or most likely owing to both these points, we secured a somewhat easy victory, the weapons used being M.B.L. rifles (Metford's and Webley-Wyley's) by our men, and rifles of American manufacture by our opponents. The weather on the days of the match was not suitable for high scoring, consequently the figures do not show up well in comparison with the records obtained by both sides during practice, in which our men made some remarkably fine shooting, one man, Major Pearse, making 99



in a possible 105 at 800, 900, and 1000 yards, seven shots at each distance, firing with a Metford B.L. rifle. This fine score had, however, been previously reached by Corporal Bates, who had made 99 at the same distances in *competition* a short time before, using a Webley rifle.

1883.

The Council of the N.R.A., having at length realised the fact that the continued use of "Any" B.L. rifles worked on the American plan was prejudicial to the best interests of both rifle making and rifle shooting, resolved this year to prohibit the plan of wiping out between shots—thus putting an end to the practice. Their action in this respect met with almost universal approval from all true lovers of the rifle, the only regret being that so many years had been allowed to elapse before such a step had been found necessary.

They, however, rather weakly allowed the long obsolete M.L. rifle to still appear in these competitions. One result of this new arrangement was the almost total disappearance of the American rifles from the prize lists. In the M.B.L. competitions the Metford rifle was again successful, securing nearly every first prize, though, on three occasions a Webley, and once a Fraser, rifle take respectively the second place. A team of the U.S.A. National Guard attended Wimbledon for the purpose of shooting a return match with a team of our volunteers, similar to the match shot in the previous year at Creedmoor. This interesting shoot took place on the two last days of the meeting, finishing in most unfavourable weather, and resulting in a second defeat for the Americans, whose rifles and ammunition appeared to require such delicate manipulation as to show that they were undoubtedly inferior for all purposes to those in use by the home team.

For a number of years the shooting of the Government pattern M.H. rifle in the second stage of the Queen's Prize

had been so remarkably erratic, particularly at the extreme range of 1000 yards, as to cause considerable dissatisfaction with the weapon among riflemen. In 1882 the shooting in this competition was of such a character as to require some steps to be taken to prevent for the future such a disgraceful exhibition as that afforded by the firing at 1000 yards on this occasion, in which considerably more than *half* the entire number of shots fired missed the targets. The Council of the N.R.A. determined to strike off the 1000 yards distance as beyond the powers of the weapon as far as accuracy of fire is concerned. Consequently this year, for the first time since the establishment of Her Majesty's prize, the "power and accuracy of English rifles and the skill of English volunteer riflemen" was *not* "shown to the world" at other long ranges than 800 and 900 yards. That a weapon costing so much to the nation, and specially designed and introduced as a long-range arm, should be the discreditable means of causing the conditions of so important a rifle competition to be altered and debased after existing for more than twenty years, is a fine commentary on the system by which such an arm was selected, manufactured, and foisted upon the nation.

Having now traced the shooting development of the present target rifle down to a recent period, I shall proceed to summarise the main steps in its progress to its present very perfect state.

It will be seen from the record I have been able to give my readers that in this country the rifle has progressed on dual lines since the production of the Enfield rifle or "large bore" on the one hand, and the "small bore," introduced by Whitworth, on the other hand. The former type of rifle has existed down to the present time (though now its continuance in the service can only be for a limited period) without any material improvement or modification other than that involved

in the conversion of the M.L. form of this rifle to the Snider B.L., a slight change in the bullet from a paper wrapped one to a naked cannellured projectile well coated with wax, being the chief alteration, the internal details of the barrel and external form and arrangements of the arm remaining unaltered. The latter type of weapon, the "small bore," has passed through some most important stages before suffering the inevitable change from M.L. to B.L. Though presented to the rifle world in a most complete state, objection was taken to the form of projectile then supposed to be absolutely necessary to the display of the high degree of accuracy of fire undoubtedly possessed by this rifle at long ranges, even in its earliest days; and the important result that we may consider absolutely *depended* upon the substitution of the smooth cylindrical bullet (the possibility of the breech-loading system) for the mechanically fitting one justifies us in looking upon the introduction of the former projectile to the exclusion of the latter as a most important step. Like similar strides in other mechanical questions, it does not appear to have been wholly made or perfected by any one individual, though there can be no doubt that Mr. Metford has done perhaps more than any one else to perfect and popularise this now universally-adopted form of projectile. The introduction of the B.L. system to the small bore rifle has been a work of considerable time, and has moved with slow steps before arriving at the degree of perfection in accuracy of fire so early attained by the M.L. rifles of this class. A great proportion of this retardation of development has no doubt been caused, in the first place, by the weight of the Government example in adopting a defective form of cartridge shell, and so leading astray in this respect for some time both rifle makers and users; and in the second place, the pernicious effect upon legitimate long-range rifle manufacture of the hybrid American model B.L.

rifle, which had to be wiped out carefully between each two successive shots—a style of using a rifle so ridiculously absurd, that even the high degree of accuracy of fire so obtained could never justify the acceptance of such weapons by the general rifle user, though perhaps one step in the education of the public in rifle matters may in some degree be attributed to this type of rifle. Since 1864 it had become not only a fashion, but among a large and growing section of rifle shots a settled belief, that a rifle barrel to shoot at all accurately at long ranges must be grooved on the plan of an increasing spiral or varying twist. The dissemination of Mr. Metford's theories had largely to do with this notion; but the American rifles were, without exception, grooved with an *uniform* spiral of rapid pitch, and their shooting has proved beyond all doubt that the supposed excellences of the varying twist exist only in the imaginations of its advocates. We have fortunately quite got rid of the wiping-out nuisance, and the influence of the Government cartridge is practically *nil*, so we may now hope to advance and reach a still higher degree of perfection with what may be considered as our national weapon.

#### THE WHITWORTH RIFLE.

Although now a matter belonging only to the history of the modern long range rifle, the weapon being itself obsolete, I cannot leave this portion of my subject without giving a short account of what is no doubt the most important step in rifle development that has been taken in the present century, or indeed in the history of these weapons.

In 1854 Sir J. Whitworth was applied to by the military authorities for his aid in investigating the mechanical principles involved in the construction of what was desired to be the most perfect rifle attainable for military purposes. The high position held in the mechanical world by this gentleman fully justified the application made to him, and one result was

a grant of some 12,000*l.* or thereabouts made to him, for the purpose of enabling his experiments to be carried out in his own thoroughly exhaustive manner. As an illustration, one of his first steps was to erect a covered gallery 500 yards in length, 20ft. high and 16ft. wide, in which all the necessary firing could be carried on without any disturbance from atmospheric changes. He was restricted to a certain charge of powder, 70 grains (then unfortunately of inferior quality), and to a weight of bullet, 530 grains, and of course the weight of the complete arm was not to be materially different from the then average weight of such weapons, and less if possible. The main defects in the existing Enfield model rifle, viz., its high trajectory, susceptibility to wind influence, and defective accuracy at any but the shorter mid-ranges, he attacked in detail, proceeding step by step, until he proved that in every point the Enfield model was defective—in calibre, length of bullet, pitch of rifling, &c. Having decided to reduce the calibre from  $\cdot 577$  to  $\cdot 450$ , his researches into the question of pitch or twist of rifling were carried out so thoroughly that he experimented on barrels rifled with every degree of spiral, in variations of 5in. from the Enfield twist of one turn in 78in. to one turn in 1in., and in this way exhausted the subject, and arrived at the conclusion that the best twist for a rifled musket is one turn in 20in., the bore being  $\cdot 450$ . This construction he ascertained to give the best results with the charge of powder and weight of bullet, and weight of arm. To such he was limited, but he distinctly states that if any modification was necessary it would be in the direction of a rather more rapid degree of spiral. It will be seen that by retaining the same weight of bullet as the Enfield in a much smaller calibre, the projectile must be much increased in length. This is the case, and is a most important feature in the Whitworth system; indeed, he says: "I have always contended that the primary element of success in long range shooting is *length of*

*bullet,"* necessitating, of course, quick rotation, to insure accuracy.

The conclusions arrived at in these experiments have not in any material point been improved upon since their first publication, and every variety of small bore rifle is based upon Whitworth's proportions in these particulars. The one detail that has since been overthrown is the mode of rifling or grooving the interior of the Whitworth barrel, and his plan of mechanically shaping his bullet to fit it. There can be no doubt that this mode of construction was adopted mainly in consequence of the poor quality of the service powder originally supplied to Whitworth, which he describes as the "siftings of the cannon powder,"\* and was wholly unequal to the work of expanding or upsetting the bullet in an uniform and reliable manner; by securing the engagement of the bullet and the rifling mechanically, this difficulty was overcome, and a fruitful source of wild shooting done away with.

Another feature at that time highly thought of in connection with mechanically fitting bullets was the opportunity afforded of using extremely hard projectiles, and so obtaining a great amount of penetration. Bullets of hardened and tempered steel have been fired from an ordinary Whitworth rifle, at an angle of 45 degrees, through a half-inch iron plate, punching out a clear hexagonally-shaped hole; such work cannot, of course, be obtained from any of the modern plans of grooved rifling firing smooth cylindrical bullets. The first objection urged against this combination was the expense of the ammunition; and to meet this a cylindrical bullet was introduced; but the accuracy of fire when these were used was considerably reduced, it being some 15 per cent. less than with the mechanically fitting bullets. As has been stated, it was soon discovered that better results with

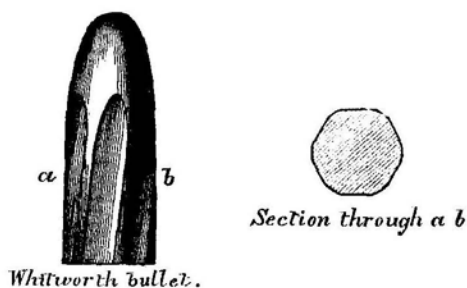
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\* Report of Committee on B L. Rifles. London, 1869.

the cylindrical bullet could be obtained if other than the Whitworth plan of rifling were used; thus the modern methods arose, and the advent of the breech-loader made possible, which would never have been the case while fitting projectiles were considered indispensable. It can be easily understood that, having met with such a decided success at the earliest stage of the introduction of his plan of rifle and ammunition to the shooting world, Sir J. Whitworth was exceedingly unwilling to lay aside what had produced such magnificent results, and therefore did not modify those details in his arrangements that grew out of accord with the progressive spirit of the times; though, as late as 1876, he produced a B.L. rifle upon a modification of his plan, having an increased number of grooves, and still retaining the fitting projectile, whose use in a B.L. rifle required a complication in the form of cartridge and chamber recess that was found to be of no equivalent value. In addition to those principles that form the foundation of long-range rifle construction, for which we are indebted to Whitworth, this branch of manufacture has permanently benefited by the highly accurate and superior tools and processes introduced by him, for, until he became interested in the question, there was no proper system of sizes nor accurate measurements employed in those details of rifles that subsequent experience has proved to depend entirely upon extreme correctness of proportion for the accuracy of fire obtainable from the weapon. Indeed, when we come to consider the great and unmistakeable advantages that have accrued to the nation in consequence, it will be readily conceded that very rarely has public money been laid out to better purposes than in the grant to Whitworth thirty years ago.

As a record of what amount of accuracy of fire the Whitworth rifle was capable, I may state that a diagram has been obtained at the 500 yards range with a mean

deviation of 3·25 inches ; and at the 1000 yards range a mean deviation of 10·5 inches ; in each case a series of 20 shots constituted the group. The annexed figures show views of



*Whitworth bullet.*

FIG. 152.

the Whitworth mechanically fitting bullet, and an enlarged section of a barrel showing the plan of grooving ; the bullet is divested of its paper jacket.

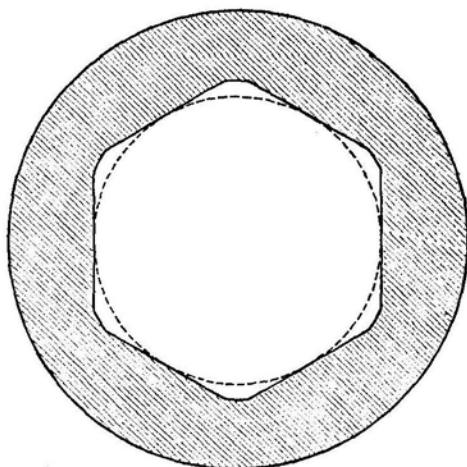


FIG. 153. WHITWORTH RIFLING (ENLARGED).



### CHAPTER III.

#### THE "ANY RIFLE" AS USED FOR MATCH SHOOTING.

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HAD the subject-matter of this chapter to be considered a year or two ago the varieties of rifle then existing, and coming under the head of "Any" rifle, as defined by the N.R.A. conditions for the regulation of the Wimbledon Meeting, would have been so numerous as to have required some large amount of space for their due treatment; but as the effect of recent legislation by the council of the N.R.A. has been to practically narrow the "Any" rifle down to what may be considered as a superior kind of M.B.L. rifle, I shall confine myself to enlarging upon those points in which the present B.L. "Any" rifle differs from that weapon. As to the M.L. rifles, though their use is still permitted, I shall consider them as obsolete, which they undoubtedly are as far as the modern sportsman is concerned. The "Any," or Match rifle in its present form is a B.L. rifle that must be fired *continuously*, that is to say without wiping out or cleaning between shots; it may be 10lb. in weight, or three-quarters of a pound heavier than the ordinary M.B.L., a point in its favour, as a heavier bullet may be fired without any corresponding increase in recoil being felt by the firer. This rifle may also have the pistol grip, a shape of stock not permitted in a military rifle for some abstruse reason or other, though, as we have seen in treating upon sporting rifles, it is always used in these latter weapons; but the characteristic feature

in this class of rifle is the elaborate sights that are permitted to be used upon them. These sights, called "Aperture" or "Orthoptic" sights, are the outcome of considerable ingenuity on the part of gunmakers and others, and were probably never contemplated when the career of the "Any" rifle, as distinguished from the ordinary Military arm, was commenced, in fact we find in the earlier Reports of the N.R.A., several complaints upon this score. Still, there can be no doubt that sights of this kind are a great advance upon ordinary "open" sights, as far at least as in localising the aim, though it appears that to bring out their full value the weapon with which they are used must be capable of discharge with the minimum of muscular exertion, as, without an abnormally light trigger pull, the fine adjustment of aim these sights permit cannot be utilised. Whether it is advisable to continue and encourage the use of a class of weapon having such sighting arrangements as to require so light a trigger action as to be positively unsafe in ordinary use, is a question that deserves consideration, though probably an objection of equal value could be raised against the sights themselves as too delicate for any ordinary use, and, therefore, possessing that unnecessary artificiality which it is desirable to banish from so practical a tool as a modern rifle should be. The tendency, however, of modern progress in this particular has been slightly in the direction of simplifying these details, but, the difference in practical utility between the ordinary M.B.L. and the Match rifle is so markedly in favour of the former, and the superiority of the latter in point of mere accuracy is so slight, that we are justified in looking forward to the time when the Match or "Any" rifle, with its *impedimenta*, will be completely replaced by its more generally useful and more widely appreciated rival. It is quite true that long range rifle shooting would not have arrived at its present pitch of perfection if it had not been for the work done in the past by

the Match rifle and its devotees ; and a similar remark would apply to other matters in the rifle world now gone and past.

That the experimentalist will always avail himself of every contrivance calculated to further his researches we may be quite sure, but that is no reason why a type of rifle, purely experimental, and of no possibly practical use in the field, should continue to be allowed in public competitions, such as at Wimbledon, to the detriment of other more useful and popular weapons.

The method of aiming with rifle sights through holes or apertures instead of open notches is of some considerable antiquity, and various devices for this purpose will be found fully described and illustrated in that ingenious old work "Scloppetaria," in the chapter on sights, pp. 124 to 150.

The modern form of aperture sights, both back and front, first appeared on the match model of the Whitworth rifles about 1861, and the credit of their re-introduction must be shared by Lord Vernon and Mr. Lcece. There have been endless variations in form and detail, but the main features in these sights as now used is as follows : A circular screen or eye-piece of such a size as to shut out nearly all extraneous objects when the eye is applied sufficiently close to it for a proper aim to be taken through a small pin hole or aperture in the centre of the screen. This hole varies in size in different specimens according to the fancy of the user, or perhaps in proportion to the distance he is in the habit of maintaining between his eye and the screen when using the same, a small hole answering if the eye is closely applied, and a larger being necessary if the eye be farther removed, the same sized field of view being retained. This screen is mounted upon a slide, having some inches of vertical movement upon the sight leaf controlled by a screw, and capable of being set to a minute degree of accuracy by means of a graduated scale generally furnished with a vernier to facilitate adjustment. The leaf is

mounted upon a strong hinge joint, and forms what is called the "back aperture sight," specimens of which are shown on the folding sheet of figures accompanying this page at Figs 158 and 160. The front aperture sight is of various forms to suit individual tastes and the exigencies of changes in light, &c. At one time a large variety of these different patterns was in use, but of late the general tastes seem to have settled upon



FIG. 161.  
SOLID BEAD.



FIG. 162.  
HOLLOW BEAD.



FIG. 163  
CALLIPER.



FIG. 164.  
SPLIT BAR.

the above: These, in various sizes adapted to the varying size of the bullseye as seen from the different ranges, are now considered sufficient for all purposes.

These front apertures or diaphragms, as they are sometimes called, can be fitted at will into a holder or shade that is mounted upon a slide having a small amount of lateral motion, for the purpose of compensating for the wind allowance that may be required; in addition, a spirit level is affixed, for the purpose of checking the position of the rifle from shot to shot, which can by this means be easily done while aiming. Two specimens of these sights are shown upon the annexed sheet at Figs. 157 and 159, one showing the wind gauge scale to the front, and the other a view from the rear or aiming side, showing the spirit level; this sight, as is shown in the illustrations of match rifles, is attached near the muzzle of the rifle, the back sight being almost invariably fixed near the heel of the butt. In this way a considerable distance is secured between the two sights, facilitating their alignment. The method of using these sights when they are properly affixed to the rifle is as follows: the user adjusts, by means of the vertical scale on the back sight, the angle of elevation of the arm to the

desired amount required by the range at which he is about to fire ; then, by a similar lateral adjustment of the front sight, he compensates for the effect upon his bullet of any side wind there may be blowing ; then, getting into a suitable position (with rifles whose sights are fitted as shown in the figures, the back position is of course imperative) he brings his eye to the small pin hole in the screen of the back sight, when his field of view is restricted to a small proportion of the landscape, the central point of which is, of course, the target with its bullseye. Supposing him to have the hollow bead front-sight, he then encircles or frames the bullseye with the ring of the sight, at the same time centering the whole in his field of view. In this

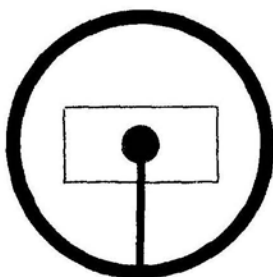


FIG. 165. SOLID BEAD.

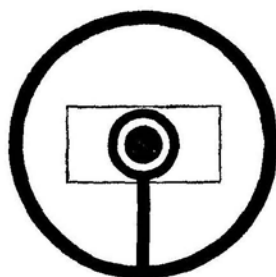


FIG. 166 HOLLOW BEAD.

he is assisted by the circular form of the front sight shade or holder. When all is duly concentric his aim is perfect, and he may venture to fire. It will be easily understood that some considerable practice is required before these sights can be fully utilised, and indeed the whole manipulation involved is of a most special and delicate character if the very highest results are to be obtained.

The annexed illustrations will give some idea of the appearance of the target when aiming with each pattern of the fore sights I have illustrated. Fig. 165 shows that when the "solid bead" is used, the bead should be of such a size as to enable us to conceal the bullseye, by covering it with

the sight itself. This may seem rather a vague style of aiming, but that the eye is able to accurately carry out this method is shown by the fine work accomplished by men who use this sight as a rule in preference to any other. For example, Capt. P. T. Godsal, whose shooting for some years at Wimbledon has been of the highest character, invariably uses this sight.

When the ordinary size of hollow bead is used the bullseye is shown framed, as in Fig. 166, and this sight is a general favourite; but a fine light is absolutely necessary for its successful use with most persons.

Some years ago the use of a very large sized hollow bead was introduced by a well-known shot in the North of Ireland, the appearance of which upon the target is as in Fig. 167.

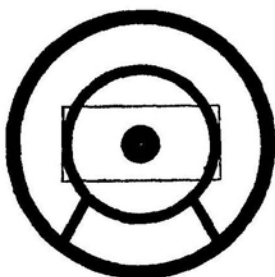


FIG. 167. LARGE HOLLOW BEAD.

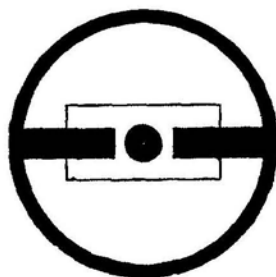


FIG. 168. CALLIPER.

It would be scarcely thought possible that really fine work could be done with such a sight, but to those accustomed to its use there appears to be no difficulty in fine scoring. The actual size of the hoop or ring approaches  $\cdot 2$  in diameter, and looks so huge as a sight that one of the mild jokes current among rifle shots arose from the fact that on one occasion, when a member of the English Eight, of rather slight physical proportions, was observed using such a sight, some one remarked "What on earth does D— want with such a sight as that?" The reply was "Oh, when he has

finished shooting he amuses himself by crawling backwards and forwards through the hoop."

The calliper sight exhibits the appearance as in Fig. 168.

This sight is an exceedingly rigorous test of steadiness, as the slightest pulsation causes the points to appear to be alternately thrust into the bullseye.

The split-bar is generally used as shown in Fig. 169, though



FIG. 169. SPLIT BAR.

some who use this sight largely have a semi-circular depression to fit the bullseye in addition to the split or daylight line.

In addition to the forms of sights of this class already illustrated I give what is considered to be a model embracing several improvements, manufactured by Messrs. D. and J. Fraser, of Edinburgh, and invariably fitted to their target-rifles, as will be shown in due course.

It will be seen from the illustration of the back sight here given that the mode of raising and lowering the slide carrying the eye-piece is very different from the usual method employed; not that this arrangement is wholly novel, having been introduced in the sights used upon the American "Sharps" model rifles. Instead of the long thin draw screw this slide is controlled by a short screw of large diameter having for its female screw each side of the main vertical slot in the leaf. The screw itself is deeply marked upon its periphery by vertical lines dividing its circumference into

a series of parts, so that when this is moved by the fingers the amount of lateral motion shown by one of these divisions on the screw indicates that the eye-piece has received a minute amount of vertical movement. Upon the outer edge of the leaf is marked the coarser graduations required, without any vernier scale arrangement, the place of which has been effectively supplied by the divisions upon the screw itself. It will be noted (see Fig. 170) that the eye-piece of this sight is much smaller in diameter than in the other specimens shown, but this can be remedied if found necessary by fixing on an indiarubber cup of any required size, an expedient indeed often resorted to with those sights having eye-pieces of ordinary pattern, as thus the eye of the firer can be placed quite close to the sight without risk of receiving a blow from the recoil of the piece during firing. This back sight is usually mounted upon the rifle in such a manner as not to require taking off at the conclusion of practice, and re-fixing before commencing firing. For this purpose a trough or cavity is made in the "comb" or upper edge of the butt, in which the sight drops when folded down, and in which it is securely protected from damage.

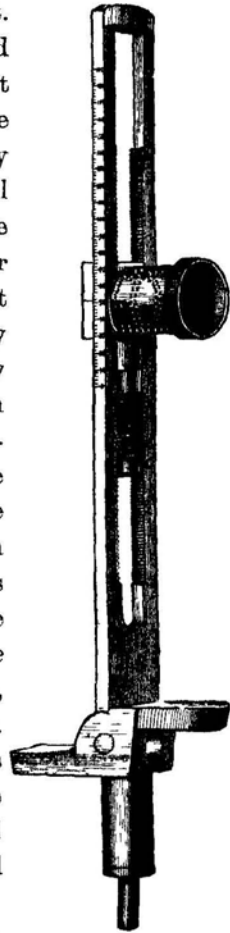


FIG. 170. FRASER'S  
BACK SIGHT.

The front sight offers no very remarkable features of difference from that of the ordinary pattern, other than the arrangement of spirit level, which in this case is let into the shade or body of the sight, instead of being attached in front as usual. The field of view



is also much larger in this construction, though these modifications throw the line of sight somewhat higher above the axis of the barrel than is the case with the sights of the ordinary pattern. The tubular shade (Fig. 172), capable of

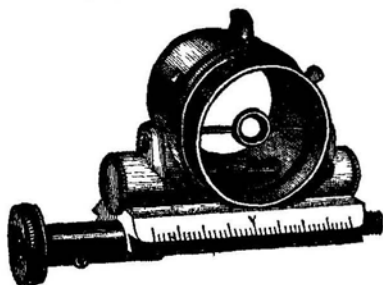


FIG. 171. FRASER'S FORE SIGHT.

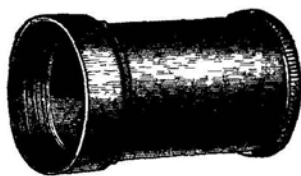


FIG. 172. FRASER'S TUBULAR SHADE

attachment either on the near or far side of the sight, according as the sun may be at the back or in front of the firer, is no doubt a most useful feature, and one of great value to the rifleman.

#### THE VARIOUS KINDS OF DIVISIONS OR SCALES UPON APERTURE SIGHTS.

Owing to the differing views of rifle makers and others connected with the manufacture and use of rifles having these sights attached, several styles of scales have been adopted for the purpose of registering the amount of elevation employed with the rifle at any given distance, and also to enable the firer to make any required alteration in a simple and easily understood manner; the conditions involved in rifle shooting not permitting the mind of the operator to be employed in abstruse considerations, as his attention is generally fully occupied in observing and combating external antagonistic influences. The one constant value to be considered mainly in the construction of such a scale is the distance between the front and back sights; and it is found that if this be taken

as the radius of a great circle, and a scale marked upon the back-sight (actually a tangent to this circle) whose smaller values as given by a vernier are equal to *minutes* of this circle, such a scale will have two advantageous features, (a) it will not be too fine, to offend the eye—as rifles are usually made; and (b) it will give definite and easily remembered equivalent values upon the target for each and every range fired at. It is not necessary here for me to give a description of P. Vernier's ingenious arrangement for sub-dividing the larger divisions of a scale, as such an explanation can be found in several of the works upon such subjects,\* though it is a matter quite necessary for every rifleman to master. When, as in the old pattern match rifles (with the back sight fixed upon the grip), the sights are three feet apart, one-hundredth of an inch upon the back sight is practically equal to one minute of angle, therefore such sights were so divided as to give upon their verniers  $\cdot 01$ , whose equivalent value upon the target was *as many inches as the range fired at is in hundreds of yards*; for instance, 1in. at 100 yards, 2in. at 200 yards, 5in. at 500 yards, &c. Though rifles are seldom now made with these sights three feet apart, the same rule holds good in all cases; but the scale upon the back sight has to be modified, that is to say, made coarser if the sights are wide apart, and finer if they are closer together than our standard three feet. Thus we find that when the sights are four feet apart, as upon most modern match rifles with aperture sights, the vernier division of the scale is  $\frac{1}{4}$ th of an inch, this being the practically linear value of one minute of angle upon a circle of four feet radius. When, on the other hand, as in most M.B.L. rifles, the sights are but two feet apart, the linear value of one minute is but the 150th of an inch, but in each case the same equivalent upon the target is obtained, as is obvious. No sight can be

\* "Drawing and Measuring Instruments." By J. F. Heather, M.A., No. 168. Weale's series. Lockwood and Co., London; 1871.

considered as correctly divided if its scale is not marked upon this basis, and it has happened probably from pure inadvertence that a rifle having a back sight scaled for a four foot radius has had its sights rather *less* than that distance apart, leading some to believe that such a rifle shot with a remarkably flat trajectory since "it required so much less elevation between ranges than did other rifles."

The happy manner in which the minute of angle fits in with our required target values has led an influential section of the rifle world, headed by Mr. Metford, to use the technicalities of "degree" and "minute," to signify their sighting work in their common conversation on angular value of elevation. So far so good; but it occurs to me that some slight misconception may arise from such nomenclature becoming current. For instance, in comparing the angles of elevation of the Metford rifle and the Government Martini-Henry, we find it stated, at page 195 of this volume, that the maximum angle of the former at 1000 yards is  $2^{\circ} 20'$ . An authorised statement is made that the angle of the latter rifle at the same range is  $2^{\circ} 52' 46''$ . Now this latter angle is measured by a clinometer (a well-known instrument for this purpose) and from the weapon when fired in a machine rest. Mr. Metford's angle is obtained, as he tells us on pp. 224 and 226, in no such manner, but by a method which mixes up other extraneous questions with this particular matter, therefore, I think it rather a mistake to allow the divisions upon rifle sights to be spoken of as degrees and minutes, unless they are really so, and actually measure the exact angle contained between the axis of the barrel and the line of aim at the moment of firing. It is but a small matter certainly, but it is as well to avoid error if possible, especially when by calling the minute spaces "points" all possibility of clashing with the true angular values, when these latter are stated, is done away with. Several rifle makers adopt this view, and it can

be no greater hardship for a man to allude to his elevation as 135 *points*, than to indulge in the misleading denomination of 2 *degrees 15 minutes*. The scales upon the front sight, for compensating side deviation of the bullet by the action of wind, rarely require to be as finely graduated as the smallest value obtainable upon the back sight, and therefore a vernier scale is a superfluous complication here. The front scale only needs dividing into spaces equal to not less than two minutes of angle upon the back sight; thus, with sights three feet apart, the scale upon the front sight would be divided into 50ths of an inch; indeed, some consider this as too fine and trying for the eye, and prefer 25ths, it being quite easy to adjust these to halves when it is necessary.

From the fact of the B.L. "Any" rifle having only, as it were, just sprung into existence, there are but very meagre data as to its excellence of performance or otherwise, as compared with the highly accurate shooting of its very artificial predecessor "the swabbed out one." No doubt the coming season will show that most excellent work can be done with a B.L. rifle fired continuously, as our M.B.L. has already shown; and could we only eliminate the remaining artificialities of this class of weapon, no doubt we should obtain some really useful information. I might give my readers some information on the most generally approved sizes of apertures, both for back and front sights, but such data are purely technical, and I find each rifle maker in this branch of business has his own particular views, shared more or less by his customers, and this renders it unnecessary for me to approach the subject. The question of ammunition for these rifles, and the best methods of loading, are also points to which the same remarks apply, full instructions being supplied for each kind of rifle by its maker, and rarely are there many points of coincidence in these details, though all strive to reach the same goal—the "bullseye."

## CHAPTER IV.

### THE SERVICE RIFLE AND ITS AMMUNITION.

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IMMEDIATELY upon the successful conversion of the large-bore Enfield M.L. rifle to the Snider B.L., attention was at once directed to the advisability of a similar development of the small-bore M.L. rifle for the purpose of obtaining a B.L. rifle having much greater accuracy, range, and power than the Snider possesses. For some considerable time this question of a good small-bore breech-loading rifle was before the public in a very crude state, some wonderful and, indeed, fearful mechanical arrangements called breech actions being from time to time produced, and sinking to oblivion one after the other, generally after blowing off some unfortunate individual's fingers, or otherwise maiming bold but rash experimentalists. The authorities at the War Office took up this matter in their usual way, first offering a reward to gunmakers and others for the best rifle and its ammunition, complying with certain conditions laid down by them. A number of inventions were brought forward in compliance, more or less, with these conditions, and a sub-committee was appointed to adjudicate on the matter, care being taken to have no person on the committee who, from previous training or experience, possessed any knowledge whatever of the complicated mechanical, and other questions involved in the construction and detail of a rifle and its ammunition; though some concession to common sense was made by placing a celebrated rifle shot on the committee. After continuing their labours for nearly three years, during which period, as their printed

reports show, they developed pretty fully their striking incapacity for the work they were selected to perform, they finally selected the breech action of F. von Martini and the barrel bearing the name of Mr. Henry, of Edinburgh, to be incorporated together by the staff of the small arms factory at Enfield, into what was to be a model long-range arm of precision. This stage in the history of the weapon did not pass without considerable cost to the nation, as some in authority turned inventors, and a considerable amount of time, and large sums of money, were thrown away in "safety locking bolts," "trigger and tumbler rests," devices quite extraneous to Martini's invention, and long since consigned to the rubbish hole. The cartridge selected for this rifle (see figure), was the "Boxer," fully described at pp. 292, 295, but, for mechanical reasons connected with the breech action, it was found necessary to crimp or bottle-shape this cartridge to the form shown in Fig. 173, thus adding other grave objections to this form of cartridge shell. A solid paper-covered cylindrical bullet, having a very slight cavity in the base, and 480 grains in weight, was used, with a wad of pure, hard beeswax, between jute disks placed over the powder (85 grains). This cartridge was at that time highly thought of by the officials connected with the Government establishments and concerned in its production; and, in a comparison between the relative value of this shell as contrasted with the solid drawn one, when it comes to the question of the respective values of the two kinds of shells for shooting, we find that in the absence of any direct experiments it is stated that, in "Col.



FIG. 173.  
MARTINI-HENRY  
CARTRIDGE.



FIG. 174. EXTERNAL VIEW OF MARTINI-HENRY (Reduced).

Boxer's opinion the superior shooting of his model shell was," &c., &c., a fair specimen of the ability of the committee in the matter of obtaining evidence. At length the rifle was launched before the public, and met with a storm of disapprobation, in some respects unreasonable, and with an equally unreasonable amount of support from its partisans. However, the lapse of time has shown that, as an accurate long-range weapon it has proved to be a complete failure, though it may not have broken down so utterly in every respect as its worst enemies prophesied it would.

Having the good fortune to be brought directly into comparison in the matter of short and mid-range shooting with a feeble large-bore weapon, like the Snider, its generally marked superiority to the latter at these ranges has gone far towards condoning in the eyes of the rifle world its other numerous shortcomings. Setting aside the defects of the cartridge and barrel, the breech mechanism has turned out to be much better than was expected, and would possess few defects if the hand of man was about twice the average size, and if delicacy and uniformity of trigger-pull was not a factor of importance in a long

range arm of precision ; and last, but not least, if it was not an ascertained fact of the gravest importance that small bore rifle barrels *must* be cleaned or wiped out from the *breech end*.

The figure on page 486 represents the distinctive parts of the now tolerably familiar outside appearance of the Martini-Henry rifle. It shows the unfavourable situation of the trigger, and the wide stride of the hand and finger required to grip the weapon and manipulate the trigger in the act of firing. The main handle or under lever used in opening the breech is no doubt an excellent arrangement for military purposes generally, though it is alleged that in the Martini-Henry carbine, used by the cavalry, it sometimes becomes entangled with the reins. The interior mechanism of the Martini breech is not so familiar to the users of the rifle as it should be, and I propose to give a short description of it and its peculiarities, without being too strictly technical, and refer my readers to the accompanying illustration (Fig. 175) showing a vertical section of the breech-action through its centre, the tumbler and trigger not being section-lined for the sake of clearness.

The "shoe," or metal framework, containing the components of the breech, is indicated by the letters (AA) within which on a hinged joint swings the block (B), whose motion is controlled by the main handle or lever (C), this latter also supporting the block in firing position, as shown in the figure. In relation to this function of the main handle it should be noted that, turning as it does about and upon the main axle (D), any resistance in closing the breech block is transmitted to this axle, though, as will be seen, this axle is the centre of motion of the "tumbler" of the firing apparatus, and has to be moved round with this latter in each operation of firing. The block (B) contains the heavy firing pin (E) actuated by a powerful spiral spring abutting upon the hollow slotted stop-nut (F). The



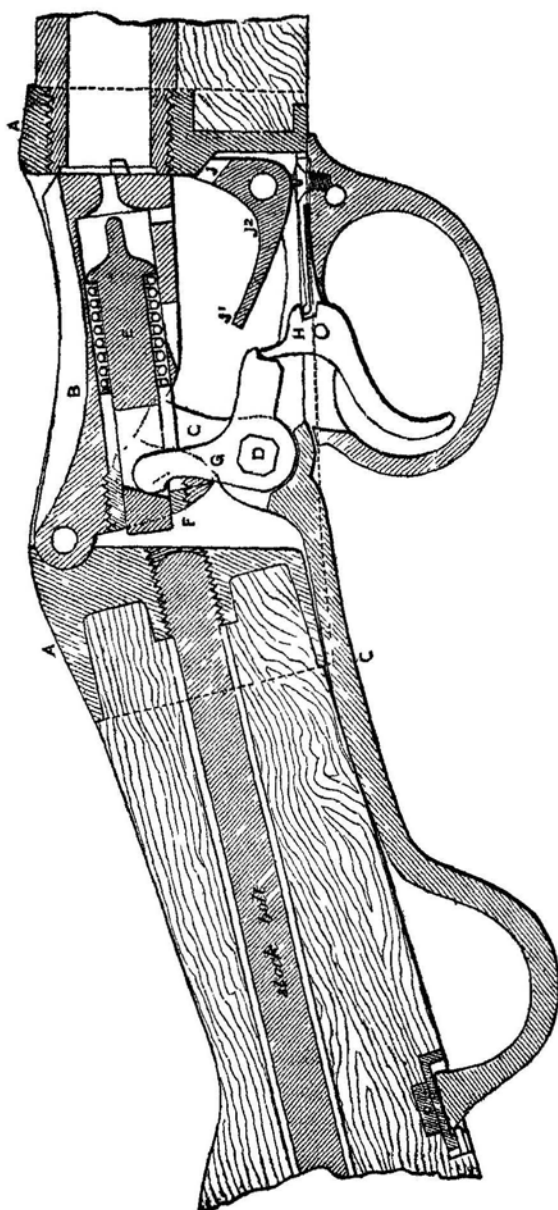


FIG 175 MARTINI-HENRY ACTION ( $\frac{1}{2}$  SIZE)

firing pin is controlled by the tumbler lever (G), whose upper end engages into a slot in the former, the tumbler fitting securely on a squared portion of the main axle (D), this latter terminating on the outside of the shoe in a finger-like projection—the indicator, shown in the external view of the rifle (Fig. 174). Thus this axis can only turn and the indicator perform its functions when the tumbler itself works, as it does in the act of full-cocking and firing. When, by a downward movement of the main handle, the block is depressed, at the same time the tumbler is carried to the position of full-cock, its lower end engaging, by means of a notch or “bent,” with the trigger-scar (H), the same movement acts on the extractor—a bent lever shown by the letter (J), the lower side of the block first coming into contact with the end of the extractor lever at (J 1), and there exerting considerable force to withdraw the cartridge shell; and then, on the continuance of the downward motion further operating upon the extractor with its extreme end at (J 2), with increased velocity of movement, thus giving the “flip” necessary to the ejection of the shell from the trough formed by the upper surface of the block and the sides of the shoe. The cocking process is completed by the return of the block to the closed position, the firing pin being retained in its withdrawn position by the tumbler, supported by the trigger. When the block is moved upwards by the action of the main handle, the mainspring suffers increased compression from the stop-nut in the block; this reaches its maximum when the block is in its place with the fork of the main handle, supporting it in position, as is shown in the figure. In consequence of the very short travel of the firing pin, and the manner in which a spiral spring so applied exerts its force, it has been found necessary, to avoid misfires with the regulation primer, to use a mainspring of some forty or fifty pounds in strength, when compressed as shown in the figure.

It will be easily seen, on examining the relative length of the two arms of the tumbler lever, that this pressure is transmitted to the trigger sear, and that the points of contact of these two components (necessarily delicate and small in area for the purpose of obtaining instantaneous disengagement in the act of firing) must suffer from the effects of this great pressure, as in fact they do, and this is the chief cause of the defective and varying "pull off" of this rifle; and another cause, as I have before indicated, the fact of the main axle labouring as it does under the varying load transmitted to it by the main handle in closing the breech against differing resistances, and then having to be dragged round by the tumbler in the act of firing. From this latter cause accidents have arisen that would have been avoided if Martini's original design had been in this particular point carried out, as he made the tumbler turn *upon* and not *with* the main axle, so that any pressure upon the latter from the breech-closing arrangements could not affect the working of the lock mechanism. It will be observed that the main handle is secured in the closed position by engaging with a small spring catch let into the underside of the stock butt. The mode of attaching this latter portion of the stock to the shoe or frame of the breech action has been proved by experience to be fairly sound; but, as this detail is carried out in the Martini, the "grip," or hand of the rifle, is caused to be unduly large at a point where any excess in size over the proportions of ordinary weapons to be used by ordinarily sized hands is extremely undesirable, to say the least of it, and might easily have been avoided in the first instance.

The only other feature requiring consideration in this rifle is, that the barrel is rifled, as stated, upon the Henry principle—the model barrel adopted by the committee, and with which the shooting was made upon which they grounded their decision to adopt it as the service arm was some three-quarters

of a pound heavier than the present regulation model, which only weighs about 3lb. 7oz., while the barrels of the most approved modern M.B.L. rifles are nearly 5lb. and upwards in weight. It needs but little practical acquaintance with the subject to appreciate the fact that a barrel so light is extremely unfit for use with so heavy a charge as that fired in the Martini-Henry rifle, while the cool audacity of still further reducing the weight from that of the first approved model is most refreshing.

The annexed figures show a longitudinal section of the M.H. bullet, with the cavity in the base. This bullet, weighing only 480 grains, is generally considered far too light in proportion to its calibre for accurate work at the extreme ranges; but on account of the already great recoil of this rifle, due to the defective proportions of barrel and cartridge, the use of a heavier bullet cannot be contemplated. The sighting details of the Martini-Henry are a distinct improvement upon these points in the Snider. The

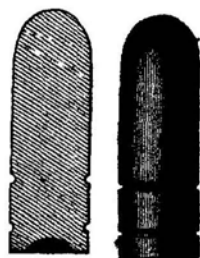


FIG 176  
M H BULLET.

backsight with a wide opening in the leaf, introduced upon the Whitworth rifles, having been taken as the model, was placed upon the barrel much farther from the firer's eye than had before been the practice, resulting in a great optical advantage in aiming. The use, too, of the flat edge of the elevating slide-bar of the sight instead of the notch or V, especially when combined with the wind-gauge lines marked thereon for lateral allowance, was decidedly a step in the right direction. Herewith is a table showing the chief points in connection with the shooting qualities of the Martini-Henry rifle, that it is advisable for the rifleman to become acquainted with:

# 492 THE MODERN SPORTSMAN'S GUN AND RIFLE.

Range.	Mean Deviation.	Angle of Elevation	Height of Trajectory.	Velocity.
Yards.	Feet.		Feet	Ft. per sec.
100	0.09	0° 25' 30"	0.234	1167
200	0.18	0 34 30	1.064	1053
300	0.32	0 48 45	2.645	982
400	0.41	1 4 45	5.074	922
500	0.55	1 19 0	8.555	869
600	0.77	1 40 12	13.155	821
700	0.95	1 59 9	19.012	778
800	1.20	2 17 12	26.360	738
900	1.50	2 38 2	35.307	700
1000	1.85	3 5 42	45.848	664

Taking it altogether this table may be considered fairly correct as a record of the performance of an individual rifle, it bears internal evidence that it can scarcely be the mean result of a number of weapons tested for the points illustrated, one noticeable feature being that the angle for 1000 yards is given as 3° 5' 42", as against 2° 52' 46", the angle given in another table of the results of experiments made some years ago. We may, therefore, while fully admitting that individual rifles vary several minutes of angle in elevation from structural causes, and that these experiments are also liable to be affected by the varying atmospheric conditions under which they are performed, venture to accept the angles given in this table as the more recent ones obtained, though it will be noticed that when we investigate the increase of angle between ranges, we shall find a rather peculiar trajectory curve; for instance, we find an increase between 500 and 600 yards of 21' 12", while between 600 and 700 yards it is only 18' 57", and again between 700 and 800 yards only 18' 3". There is evidently some slight error here, though between 800 and 900 and 1000 yards, the values given nearly approach those obtained in actual shooting.

It will be interesting to place upon record here what may be considered as the finest results hitherto obtained with the Martini-Henry rifle, firing the Government ammunition, in public competition, and therefore, being thoroughly *bonâ fide*.

At the late Middlesex Rifle Meeting held at Wormwood Scrubs, Private G. Rosenthal, H.A.C., made the following score, which is probably the best actually made under similar circumstances up to date.

200 yards .....	4 5 4 5 5 5 5 = 33
500 „ .....	5 5 5 5 5 5 5 = 35
600 „ .. ..	5 4 5 5 4 5 5 = 33
	—
	101

The highest possible score being 105 marks. The shoot was made in the prone position, and with a rifle of private manufacture,\* this being, of course, in compliance with the Government viewers' gauges, &c.

At a M.H. competition of the North London Rifle Club this season the same gentleman made the following fine score under the new conditions of the Queen's Prize :

800 yards .....	3 3 5 5 3 5 4 5 4 = 42
900 „ . . . .	4 5 5 4 5 5 5 3 4 5 = 45
	—
	87

The H.P.S. being 100 marks. This is probably the best score yet made under similar conditions.

#### THE NEW MARTINI-ENFIELD.

The shortcomings of the service rifle having at length become recognised by the official mind, the result has been that for some time efforts have been made to produce a superior weapon for the future arm of the British soldier. In 1880 a match was shot between teams of the Midland Rifle Club and the North London Rifle Club at the long ranges, and the scores obtained were so excellent as to cause some considerable amount of notice to be given to the subject, and surprise was expressed that the service rifle was not repre-

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\* By P. Webley and Son, Birmingham.

sented in the shoot. For some time, however, this rifle had been conspicuous by its absence from the long-range prize lists at the Wimbledon Meetings. The authorities, stimulated by this occurrence, decided to appoint a sub-committee to investigate the question of an improved small-arm for the service rifle, and the researches of this committee, together with the efforts of the officials of the Enfield factory combined, have produced the new model weapon that I will endeavour to describe; though, as the final stage of experiment in some respects has not yet been passed by this arm, and it is in consequence not yet formally adopted into the service, my information is not so complete as I should wish it to be; and changes in detail may yet be made, perhaps in some respects rendering my description imperfect. Externally the new rifle resembles the present one, as the same breech-action is used, the authorities not yet having realised, apparently, that among other points it is most necessary that B.L. rifles should admit of cleaning from the breech end. Some concession, has, however, been made in another direction, by an effort to reduce the size of the "hand" by modifying the shape of the action at this point, but only to a slight extent. A most noticeable feature in the new gun is the novel form of the fore-stock, in which usually the barrel is embedded; whereas in the new pattern the barrel is not fitted into a groove in the wood, but simply lies upon the flat upper surface of the fore stock, to which it is attached in the usual manner by bands. This shape is adopted mainly in order that the barrel may be got at upon the whole of its external surface, so as to be wiped and oiled if necessary—much objectionable corrosion having taken place when the barrel is partly covered by the wood, as heretofore has been the invariable practice.

A detachable wooden cap or cover is fitted to the barrel where grasped by the left hand of the firer, to prevent incon-

venience from the barrel heating with rapid firing—a contrivance introduced some twenty years ago by Westley Richards. The sighting arrangements of the new arm are of a two-fold character, the fore-sight and back-sight are fixed upon the barrel in the usual manner and position, the back-sight being very similar to the present model, only that a laterally movable slide, that can be pushed from side to side with the thumb and fingers, and so adjusted in reference to a scale for wind allowance, is in this case combined with the usual vertically moving slide for elevation adjustment. This slide, when the sight leaf is folded down, is used for the shorter ranges, up to 500 yards, a short auxiliary flap to suit this latter range is also fitted to the sight, so that it can be at once raised, and without further adjustment it will enable the arm to be effectively used through the entire “dangerous space” covered by the weapon, when fired at that amount of elevation. The rifle as at present constructed has an additional set of sights, that can be attached when firing at extremely long ranges is considered necessary. The sights are fixed, when in use, at the left side of the weapon, the back-sight being merely a bar hinged so as to fold close to the barrel when not in use, and capable of being opened out so as to afford a fixed aiming base. The front-sight, having both vertical and lateral adjustments, is fitted into a slot in the left side of the upper band, and, when opened out ready for use, is of an L shape, the vertical and longer arm sliding in the band slot, and graduated so as to permit of vertical adjustment for the required elevation, while the shorter horizontal arm has a sight of the usual shape, that can be moved at will, to give the desired amount of wind compensation. The greater portion of the sight depends below the rifle, and the firer does not have to raise his head abnormally when aiming at an object, say 2000 yards off, but the lowering of the front sight elevates the muzzle of the rifle, and thus produces the desired effect. Of course it remains to



be seen if such sights are desirable or necessary, or capable of being used in actual warfare. The next points to be considered are those relating to the barrel and the cartridge. The barrel, which is some ten ounces heavier than that of the Martini-Henry, is of a much smaller calibre, only .400 in diameter, or the 20th of an inch less than our present small-bore, the object in introducing this feature being, of course, to lower the trajectory, and make the chances of error in judging the enemy's distance so much the less.

This has been attained to some marked extent, but not without some little sacrifice in return, as it is found that the bullet fired from this small calibre is rather more susceptible to the influence of a side wind than the more massive projectiles fired from our ordinary M.B.L. rifles; again, it may be questioned whether this small calibre—which is so much the more difficult to clean and keep in order, especially in a rifle with a Martini breech, where all the chafing must take place at the muzzle—the most vital part of the barrel in relation to accuracy of fire—will not rapidly get out of order. The Henry plan of rifling has not been applied to this new arm, but a variety of the “ratchet” instead, which the authorities at Enfield have cut in rather a quaint fashion; that is, they have reversed the shape of the cut, making the long slope of the ratchet the driving side, instead of the shorter one, as is usual. As I have before remarked, there is but little advantage either way in small variations in form in plans of rifling, and this may be of use under the conditions existing in this particular arm and its ammunition. For instance, it is proposed to use an unpatched bullet, and, consequently, the paper shearing value of the usual form of ratchet groove is not wanted; and as there is no material change in the plan or substance of the lubrication employed in the cartridge, it is important to offer sloping surfaces to the gas blast (see p. 347).

As to other and more recondite questions they have probably never yet entered into the minds of the designers of this arm.

The cartridge is a solid bottle-shaped one, with about the same proportions of powder and a little lighter bullet than those of the M.H. cartridge; and no doubt, under some conditions, some very fine shooting has been obtained from this combination; but I can say nothing either one way nor the other, except that we must wait to see it in the hands of our great and unequalled volunteer shots before we can fairly arrive at a proper estimate of the merits and defects of this new plan.

The simple fact that professional advice has been, as usual, strictly avoided during the construction of this arm, would cause anyone versed in the rifle experiences of the last twenty years, to look rather dubiously on a weapon produced by merely military men and amateurs, though aided by the Enfield staff. But, unfortunately, this body, from their isolated position and necessarily restricted base of operations, making as they do but one type of rifle to their own standard of excellence, cannot possibly have the wide range of experience only to be obtained in the general rifle business, and which should have been utilised by any committee dealing with so important a question as the future national weapon.

## CHAPTER V.

### THE MODERN MILITARY BREECH-LOADING RIFLE, OR M.B.L.

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It will not be necessary in approaching this division of my subject to consider any other specimens of this class of weapons other than those of approved and currently existing types. I can, therefore, only allude to such early forms of the M.B.L. rifle as the "Henry," having the drawback of a side lock requiring to be cocked in the same manner as a muzzle-loader; the "Westley Richards falling block," an early type of self-cocking single rifle breech action, whose clumsiness of design and ponderous weight soon consigned it to oblivion; the "Soper," a more meritorious arrangement, full (indeed, too full) of ingenious mechanism, but which has latterly passed away from before the public; and other more or less ingenious constructions that it is not now necessary even to name. I shall proceed to give descriptions and illustrations of the four or five rifles that can now be considered as fairly before the public, taking them in the order of their appearance upon Wimbledon Common.

#### THE FARQUHARSON-METFORD, BY GIBBS.

The first rifle we have to notice is the Farquharson-Metford rifle, made by Gibbs, of Bristol. Whatever may be the ultimate degree of success attained by rifles constructed on Mr. Metford's principles, a large share of the credit attached to such success must always belong to Mr. Gibbs, to whose energy and perseverance it is due that the niceties of detail

and general accuracy of manufacture these rifles specially require has been applied to them, and in a manner to insure the success of the plan, and establish it beyond doubt before it was in any way taken up by other rifle makers.

It is not necessary for me again to go into the special features of the Metford plan of rifling and bullet; suffice it

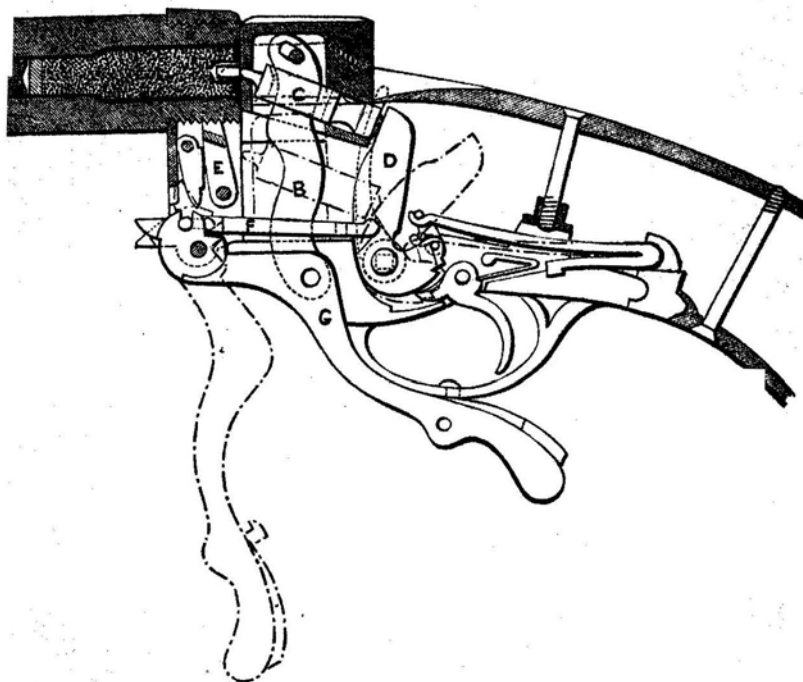


FIG. 177. SECTIONAL VIEW OF THE FARQUHARSON BREECH ACTION,  
BY GIBBS.

to say that when carefully made, and in good condition in every particular of rifle and cartridge, the Farquharson-Metford weapon has given most excellent results. The breech action is given in section in the accompanying engraving (Fig. 177), in which most of the parts are shown in two positions—i.e., with the breech either open or closed.

The breech-action is in principle the invention of Mr. Farquharson, of Blairgowrie, the originator of the shooting position bearing his name, and was purchased of him by Mr. Gibbs as a registered design. In construction it is founded on the well-known block (A) lever (G) and link (B), first introduced in England as "Sharps"; but Mr. Farquharson added a simple and effective mode of self-cocking, consisting of a horizontal bar and cocking rod (F) swivelled to the fore end of the hand lever (G) and beyond its fulcrum. This bar engages in a recess, or notch, on the breast of the hammer (D) above the pin, or axle, on which it works; when the hand lever is depressed to open the breech, the hammer is by this horizontal bar pushed back into the firing position, shown throughout in dotted lines; the breech block then falls to the bottom, when it comes into contact with the ejector (E), and the empty case is thrown out. Another important part of this action is, that provision is made for releasing the striker from the back of the cartridge after firing by means of a slot in the link (B), which allows the block to remain unmoved for a moment, when the hand lever is depressed to open the weapon, so that the hammer is pushed back about the eighth of an inch before the block moves. The ejector of this action is of greatly improved construction, and is introduced in a subsequent patent. (See Fig. 178.) It possesses greater power of ejection than any other to be found; and the lock is of simple construction, having only one spring in its internal mechanism, viz., the mainspring. Nor are there more than two screws in the entire action, pins being used, which can be pushed out and put in by the most unskilful hands; and the whole internal work—that is, lock, lever, link, and breech block—can be lifted out bodily, without derangement of any kind, and oiled, and cleaned, and replaced without a single tool, or the aid of an armourer.

It was first issued to the public in the form of a military

breech-loader, with the Metford barrel, in the year 1874, and it carried the Duke of Cambridge's Prize in five successive years. This prize is competed for at 1000 yards, fifteen shots, without cleaning out, which is considered a severe trial of the non-fouling of any rifling, in addition to its accuracy. It is also well adapted for a sporting rifle, and is extensively patronised, as already stated. (See Fig. 179.)

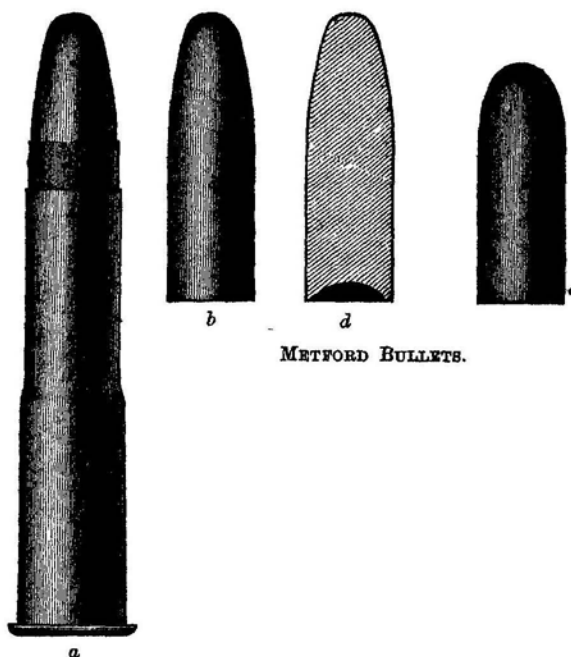


FIG. 180. METFORD CARTRIDGE.

The annexed figure (180) shows an external view of the loaded cartridge used with this rifle, also a view of the bullets, both heavy (*b*) and light (*c*), with a section of the former (*d*) showing the cavity in the base.

For some time Mr. Metford held out for the lighter bullet, 480 grains in weight, as the thing to be used with his moderate powder charge in a B.L. rifle; but his views underwent a

change<sup>as</sup> about 1879 or 1880, since which time the heavier 540 grain bullets of a rather peculiar shape have been almost universally used with his rifles.

Mr. Metford professes to use no lubrication in his cartridges, and, indeed, so small a powder charge does not demand much, all things being in perfect condition; but it is well known that the tightly fitting felt wads used as a fire block are well saturated with beeswax; and as this substance is the recognised means of lubrication adopted in the Government small arm ammunition, we must believe that some little help is afforded in this respect by this material, though it is generally looked upon as a rather refractory agent for the purpose. If Mr. Metford issued for a season waddings totally free from admixture with any lubricating agent, he would then have no difficulty in persuading the public that his admirable rifle worked without such aid. The sights (Figs. 181, 182) are too well known to need description. \*

#### THE DEELEY-EDGE-METFORD RIFLE.

A rifle bearing this designation first appeared at Wimbledon in 1878, but the breech action was very different from that of the present rifle I am about to describe; in fact, the then pattern action was found so very unsatisfactory that the new model was brought out most opportunely a year or two ago. (See Figs. 183A, B.) Attached to the Metford barrel, identical in every principal feature with the barrel used by Mr. Gibbs, this rifle, of course, would be naturally expected to shoot with a similar amount of accuracy, which in fact it does, though as a rule I believe a rather increased powder charge is used with it, as compared with that originally advocated for use in a B.L. rifle by Mr. Metford. Fig. 184 gives an idea of the side external view of this breech action. Fig. 184A shows a view of the opposite side of one of these rifles, with the stock butt removed, and shows how a safety bolt is applied,



FIG. 184. EXTERNAL VIEW OF DEELEY-EDGE-METTFORD RIFLE, SHOWING BRANCH ACTION.



though, as my readers will perceive, its action is rather too near the centre of motion of the hammer to be quite a perfect mechanical arrangement.

In this action, which is upon the sliding-block principle, the breech has a vertical groove, or slot, at right angles to the bore in which the block works; this block is depressed and raised by means of a side lever, which actuates an axis crossing the body of the gun under the breech end. This axis is the main feature in the mechanism, and performs the threefold function of opening the gun, cocking the hammer, and working the extractor. The axis has on one side a pro-

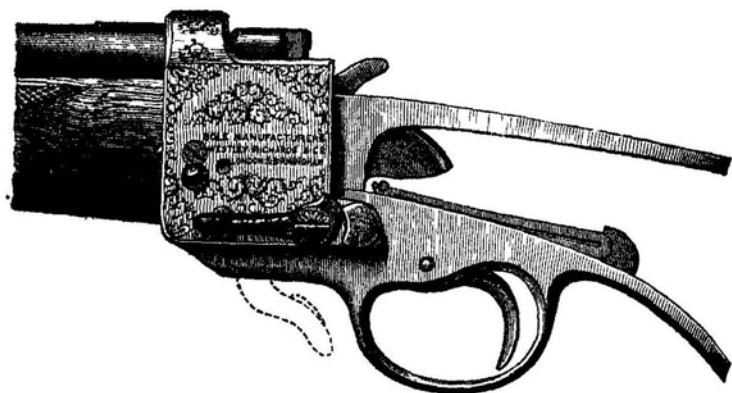


FIG. 184A. DELEY-EDGE BREECH ACTION, SHOWING SAFETY BOLT.

jection which takes into the recess on the bottom of the block, and when the lever is depressed the block also is depressed and the breech opened. On its left side it carries a projection for working the extractor, and in the centre of it there is a short arm, or projection, which effects the cocking in the following manner:—At the rear of the axis is a small lever, one end of which is situated under the short arm of the axis, its other end engages under the shoulder on the breast of the hammer. When the hand-lever is depressed the fore-end of the lever is depressed by the short arm on the axis, and

thereby the rear end is raised and lifts the hammer into cock,\* in which position it is retained by the ordinary bent and scear.

The main-spring and scear-spring are of the usual gun-lock type.

The action is light and simple in construction, and of great durability.

The military model of this rifle is constructed in accordance with the N.R.A. regulations, Class IB, for military breech-loaders. The action is light, which enables a heavy barrel to be used, and by depressing the lever, a clear view of the barrel can be obtained. This renders it easy to inspect the rifling, and to clean the barrel from the breech end, which is of great importance. (See Fig. 183A.)

The cartridge used is the well-known Westley-Richards No. 2 musket cartridge, with 80 grains powder, two waxed waddings, and a specially prepared projectile, weighing 540 grains. If required, a lighter bullet, weighing 480 grains, is supplied for short ranges. The broad back sight is upon an improved principle, with a sliding wind-gauge bar and graduated scale, as now permitted by the N.R.A. The top-piece and bar have each a central platinum line, and are supplied with a straight-edge or V notch to order.

The rifling is upon the celebrated Metford system, the form employed in this rifle being what is termed a shallow seven-groove segmental cut. As regards the accuracy of this weapon (and also the Match Rifles made by the same firm), references need only be made to its public records, the official reports of the National and other Rifle Associations showing that it is at least fully equal to anything before the public.

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\* This feature is not wholly novel, it having been applied in Manton's patent some years ago.

**THE DEELEY-EDGE-METFORD MATCH RIFLE.**

The same breech action being employed as for the military rifle, similar advantages as to weight of barrel, cleaning out, &c., are obtained, but the construction of the match rifle is, of course, in accordance with the N.R.A. regulations for "Any Rifles." It is half-stocked, with a pistol grip, and weighs 10lb. (See Fig. 183B.) In this match model an addition is made to the breech action, in the shape of a neat tumbler bolt placed upon the left side of the breech, which securely bolts the hammer when at cock. The stock can be constructed for any of the positions now adopted by small-bore men. This barrel is also rifled upon the Metford system, the form of rifling and other points having been recently modified to meet the new rule of the N.R.A. which prohibits cleaning. The sights (Figs. 185-6), which have been constructed in accordance with the views of some of the most eminent shots of the day, consist of a long orthoptic back sight, which can be used upon the grip or heel, as desired, and a wind-gauge fore sight, with spirit level, shade, &c., for which fore sight discs of various patterns are supplied to interchange. There is an ingenious arrangement in the back sight by means of which the zero may be adjusted, and the angle of elevation made to read differently. This enables men who are shooting at nearly the same angle to alter their zero (which can be done instantly) and shoot at one common angle—a considerable advantage in team shooting. There is also a similar arrangement in the fore sight by which the wind-scale can be readily re-adjusted. This match rifle employs the same cartridge case and projectile as the military model, but the charge of powder is increased to 90 grains.

**THE DEELEY-EDGE-METFORD MILITARY AND MATCH BREECH-LOADER COMBINED.**

In order to meet those shots who desire to take up match rifle shooting as well as military work, without incurring the

expense of two rifles, Messrs. Westley-Richards and Co. are issuing a combination weapon; that is to say, they fit up the military rifle with best orthoptic match sights. The match fore sight is constructed with a collar, which slips on to the muzzle in rear of the ordinary fore sight, and is secured by a screw. A bed for the orthoptic back sight is let into the stock, and when these match sights are put on the rifle is ready for "Any Rifle" competitions. They can be removed instantly, and the weapon again becomes a regulation military breech-loader.

Messrs. Westley-Richards and Co. have secured the exclusive control of the breech action, so they are the sole manufacturers of the Deeley-Edge-Metford rifles.

The ammunition used with this rifle is the same as that used with the rifle just described.

#### THE WEBLEY-WYLIE M.B.L. RIFLE.

Another of this class of rifles specially constructed for a high degree of accuracy of fire at the long ranges, is the above named weapon, manufactured by the firm of P. Webley and Son, Birmingham. In this rifle (Fig. 187A) is carried out to its fullest extent that well known and favourite principle among rifle shots—viz., the use of a heavy barrel. This can be done in this particular instance, in consequence of the exceeding lightness of the breech action, which is quite a pound lighter than the Government pattern Martini breech. This thrown into the barrel enables the maker to obtain one of 5lb. and upwards in weight as compared to the M.H. barrel of only 3½lb., the complete rifle still not weighing more than 9½lb. In this matter this rifle, which first appeared in 1879, has most decidedly led the fashion since become general among M.B.L. rifle makers, who, before their attention was thus called to this important detail, had somewhat lost sight of its importance, influenced no doubt by the scanty proportions of the barrel the Government

had thought fit to adopt. This breech action, though so light (not quite 1½ lb. in weight), is strong and compact; the act of opening the breech both puts the lock mechanism to full cock and extracts and ejects the fired shell. The mode of igniting the cartridge is by the sharp blow of a hammer urged by a light mainspring, but having a considerable "scope" or amount of blow. This hammer is situated in the centre of the upper strap of the action "body," and can be operated from the outside by the thumb, and so placed at full or half cock. The accompanying figure (188) will give an idea of the appearance of the breech of this rifle, showing as it does the mode in which the block works in the shoe or body of the action; also the situation of the hammer and trigger:

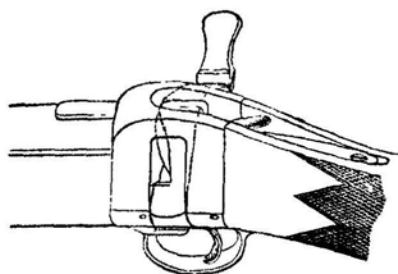


FIG. 188. WEBLEY-WYLEY BREECH ACTION.

In consequence partly of the large angle through which the hammer moves, and the position of the firing pin or striker, which coincides with the axis of the barrel, a very light and elastic mainspring of the simple flat form is amply sufficient to insure ignition, and, as a necessary result, the "pull off" of this rifle is most remarkably "sweet" and uniform.

The breech action is operated on in a somewhat similar manner to that of the Snider rifle, though the extraction is effected without an extra motion being required, as in that arm. The handle or main lever is simply an extension upwards from the right-hand side of the breech block, as is

shown in Fig. 188. Although this arrangement has a very neat appearance, if an objection were raised against it, it would be on the grounds that, first, there may be a want of that surplus leverage required at times for the extraction of a defective and refractory shell; secondly, that the action might be more affected by the sand test than some others, in most other respects this breech action reflects great credit upon the mechanical ingenuity of its inventor, Mr. A. Wyley, who has in its construction displayed great ability in con-

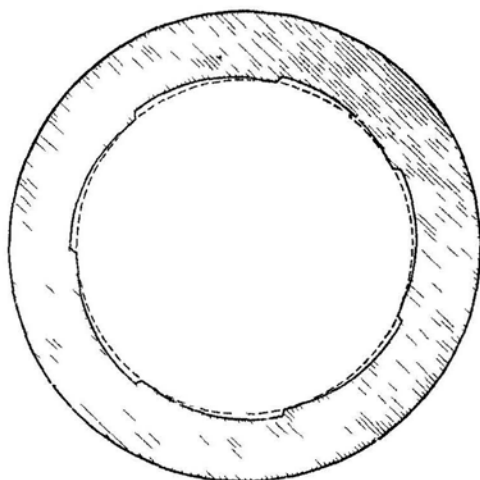


FIG 189 ENLARGED VIEW OF "RATCHET" RIFLING, AS SEEN FROM BREACH END OF BARREL, USED IN THE WEBLEY-WYLEY MBL

sidering every important detail of the necessary mechanism, and in compressing these into such a compact form—a point much neglected by most designers of breech actions for military rifles before he, by his work, called attention to the importance of keeping the breech within reasonable limits of both weight and size, so that the surplus metal can be thrown into the barrel, where it is of considerable value.

The barrel of this rifle is about .458 in calibre, and is rifled

as is shown in Fig. 189, that is with seven cuts of "ratchet" shape and with a uniform twist of one turn in twenty inches—Whitworth's standard pitch. The cartridge, which is shown in Fig. 190, is, of course, of solid metal, and is loaded with from 80 to 85 grains of powder (according to the fancy of the firer, good work having been done with both charges), and a 540-grain bullet of the shape shown in Fig. 191. In addition to the hard felt wadding used in this and other M.B.L. rifles, a lubricating wad is considered to be valuable in this ammunition. It is but a few grains in weight, and when the cartridge is properly loaded is securely placed between the bullet and powder in such a manner that there is little or no possibility of the lubricating material acting detrimentally upon either, when the ammunition is stored for any length of time. That this combination of barrel and

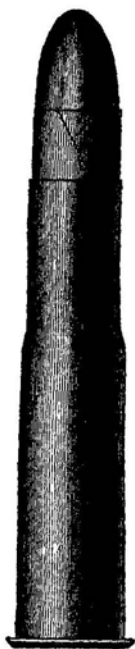


FIG. 190.  
WEBLEY CARTRIDGE.

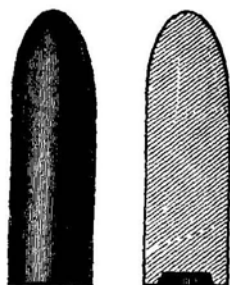


FIG. 191.  
WEBLEY BULLET.

ammunition is sound and effective, and capable of producing the finest shooting, is proved by the performances of this rifle as shown in the N.R.A. reports of the Wimbledon meetings. Introduced in 1879, and only used by comparatively a very small number of rifle shots, it has still fairly rivalled the Metford B.L.'s in carrying off most of the chief long

range prizes open to this class of weapon, though, from the early popularity of the Metford rifles, some twenty of the latter are in use to one Webley-Wyley. Among other features introduced with this rifle is the extra wide back sight shown in the annexed Fig. 192, now so generally adopted on rifles

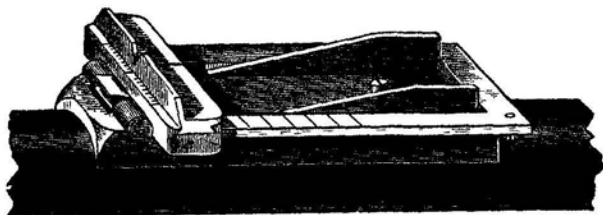


FIG. 192. WEBLEY-WYLEY M.B.L. BACK SIGHT.

of this kind, though the wind-gauge slide bar shown in the figure is a more recent addition to it.

An organization called the Midland Rifle Club exists at Birmingham, that was established some nine years ago for the object of cultivating and developing the M.B.L. rifle, especially at the longer ranges; and the Webley-Wyley rifle was first constructed to meet the requirements of some of the members of this club.

Since its introduction into their competitions it has carried away the great majority of their principal prizes, though their shooting is of the most exacting character, eliminating as far as possible the element of chance. I give the shot for shot record of the fine score of 99 made at one of their competitions by Corporal Bates, of the 1st W.R.V.B., using this weapon.

800 yards . . .	5 4 5 5 5 5 5 =	34
900 " . . .	5 5 5 5 5 5 5 =	35
1000 " . . .	3 5 3 5 5 5 4 =	30
		<hr/> 99

The highest possible score being 105 marks.



*THE FRASER BREECH-LOADING LONG-RANGE RIFLE.*

The breech-action is constructed on the vertical sliding-block principle, first applied practically to small arms by the Sharps Company of America. Rifles manufactured by this firm were used in the American Civil War, although the weight and general clumsiness of the action, with its cumbersome outside hammer, rendered it a most ungainly weapon. The system was, nevertheless, sound, and many of our best known rifle makers have worked on the same lines with a variety of modifications, but all striving to produce as compact an action as possible; consistent with strength of breech mechanism and lock work.

Working on the basis above indicated, Messrs. Fraser have succeeded in perfecting a breech in which the various limbs are much stronger than those of the Government regulation Snider or Martini rifles, and as regards strength of action shoe, I may state that, all their rifles are provisionally proved with the actions fitted to the barrels, thus undergoing the severe strain of double proof at one time.

In ordinary cases the stock is held to the action by means of metal projections, called straps, passing from the breech-shoe over and under the grip or small, with screwed pieces binding the parts together. This action is attached to the stock by a strong steel bolt entering from the butt, which serves the double purpose of securing the wood and metal by end-on pressure, and gives great rigidity at the grip, where strength is most required. (See Fig. 193.)

A detailed explanation of the working of the action seems to be unnecessary, as the illustration shows very distinctly how the several movements are effected. It may be sufficient to say that when the breech-block is lowered by means of the side lever so far as to place the rifle on full-cock, the extractor comes into operation, and is projected with great

power a short distance, sufficient to ease the shell out of the chamber, the head of the hammer then forces back the safety bolt, causing a flip which ejects the empty shell clear of the rifle without the necessity for any special springs.

The action of the safety bolt is so clearly shown in the cut as to require no explanation.

The general adoption of the back position by long-range shots necessitates the use of a longer orthoptic or rear sight, and the inconvenience, not to say danger, of having this delicate sight exposed, suggested to them the possibility of forming a sight-case in the stock itself, a reference to the

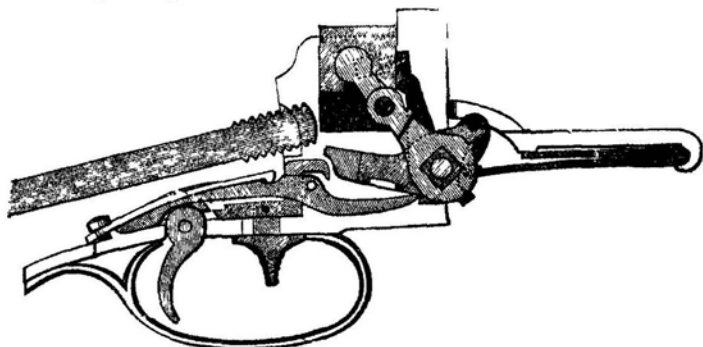


FIG. 193. SECTION OF FRASER'S BREECH ACTION.

illustration (p. 479) will show how this has been accomplished. The recess is provided with a cover removable at pleasure, and which effectually protects the sight from injury. The improved front wind-gauge is constructed with a much larger field than usual, which enables the spirit level to be placed within the disc shield, where it lies close up to the disc and point of aim, an arrangement which reduces the strain on the eye when sighting. They further claim novelty for a reversible metal sun-shade, screwing on to front or rear as required; also for having a scale cut on both sides of sight-bed, so that the firer when in position need not turn the muzzle towards him when adjusting the sight for a change of wind. (See Fig. 194.)

Messrs. Fraser describe the form of rifling adopted by them in the above rifles as a "hollow ratchet," that is, instead of retaining the old saw-tooth groove, which consists of a straight plane ending in an acute angle at the minor axis of the bore, they hollow the groove and leave a land of  $\cdot 05$  in width. This plan has for its object the steadying of the bullet in its passage through the barrel, and also prevents that premature stripping of the patches so fatal to accurate shooting at extreme ranges, while the shape of the groove has the effect of lessening friction, and, as a consequence, giving increased velocity.

The spiral of the rifling is progressive, beginning at the breech end almost straight, and increasing at the muzzle to one turn in 16in. The bore of the rifle is  $\cdot 455$ , and the depth of groove at resisting edge  $\cdot 005$ . Number of grooves, 7.

The pitch of the spiral or twist has been determined by careful experiment, and they claim for this plan an almost entire absence of fouling, at the same time preventing the jamming action almost inseparable from those forms of rifling which consist of a number of acute angles.

They make use of a bottle-shaped solid drawn shell, charged with 80 grains powder, special lubrication, and a bullet which weighs 530 grains.

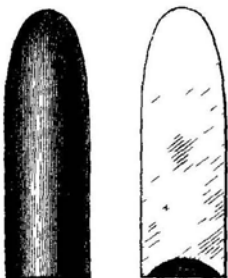


FIG. 195. SECTION AND VIEW  
OF FRASER BULLET.

I here give a sketch of the Fraser bullet (Fig. 195), and also a section showing the cavity in the base. I am unable to show the entire cartridge, or to give any record of scores made by this rifle which, practically, only made its appearance during the late season, though several fine scores were made with it at the Wimbledon meeting.

## THE RIGBY-BANKS M.B.L. RIFLE.

This is a new breech action for single rifles, military, match, or sporting. It is a vertically sliding block action with automatic hammerless lock, and possesses the following distinctive features:

It is usual to attach the stock to the breech frame of military and other rifles by means of a bolt passed up through the butt and screwed into the frame. In the Rigby-Banks rifle this has been improved by substituting for the bolt a steel tube screwed firmly into the frame, and having on its rear end a screwed nut, which serves to hold the stock in its place. Inside the tube is a coiled main-spring 5in. in length, within which slides a steel rod whose forward end is in a convenient position to deliver, under the impulse of the spring, an effective blow upon

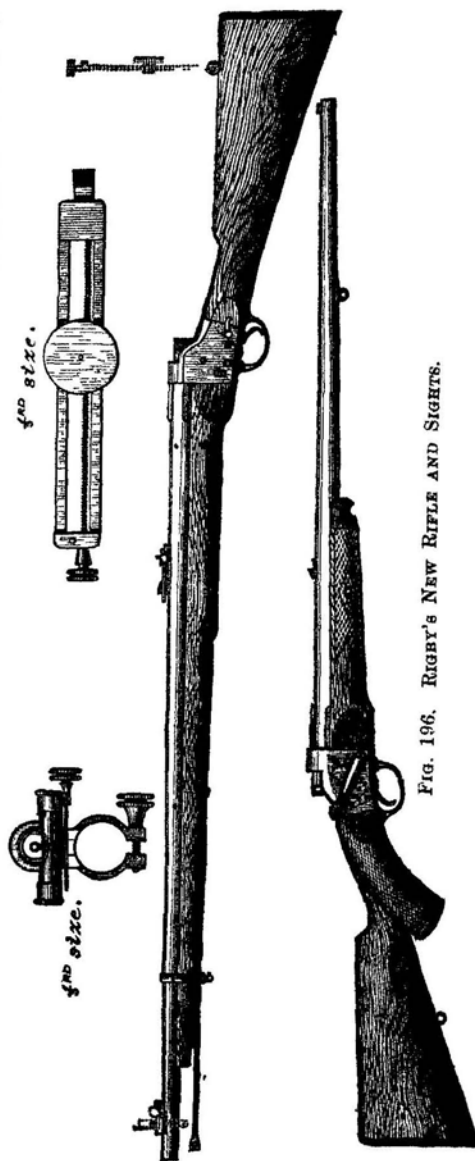


FIG. 196. RIGBY'S NEW RIFLE AND SIGHTS.

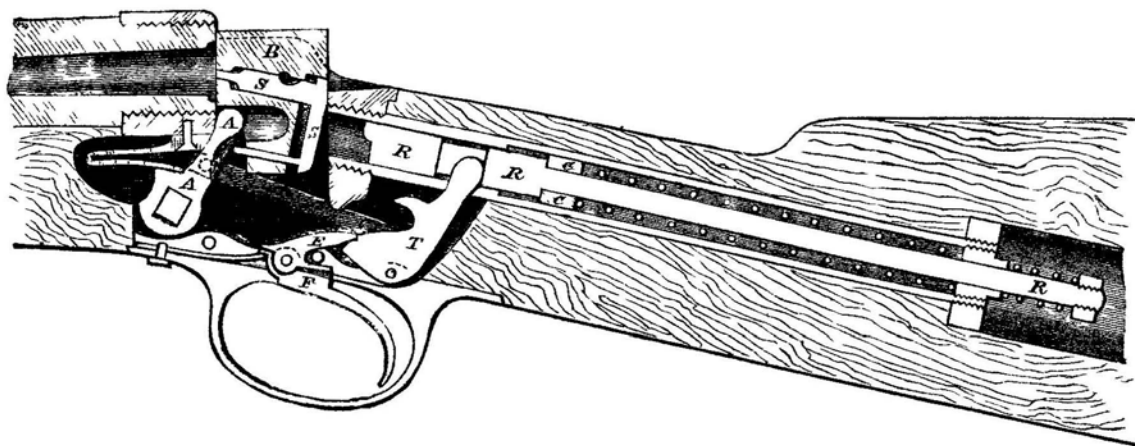


FIG. 197. SECTION OF RIGBY'S BREECH ACTION.

A A, the arm which lowers and raises the block B B.

B, the sliding breech-block, into which is fitted the striker, S S.

R R, the rod or hammer, a slot in which receives the head of the tumbler, T

C C, the collar sliding in the tube and on the rod, R R, which is thereby made free to strike and rebound.

E, the sear shown in the bent holding the tumbler at full cock.

F, the trigger, working on the same pivot as E.