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MAGAZINE RIFLES IN WAR—A MILITARY PROSPECT.

By T. A. PERRY MARSH, Surgeon-Captain Army Medical Staff.

THE memorable struggle between the Muscovite and Turk in 1877 was the last occasion on which two great European Powers met in conflict. Since that time the army of every Power of importance has been, or is being, rapidly rearmed with a new form of magazine rifle. This weapon differs from all others of which we have had any battle experience, not only in possessing a magazine, enabling a number of shots to be poured in rapidly at a critical moment, but also in the important particular of a greatly reduced barrel calibre. Though the exact amount of reduction in calibre has differed amongst the various nations, yet the main features of a smaller, lighter, and harder bullet have been universally adhered to in the rearmament of all. In our own Army the 0·450-inch calibre of the Martini-Henry has been superseded by the 0·303-inch of the Lee-Metford.

Taking into consideration the great expense incurred by the various countries in providing a new rifle for their huge armies, in which the infantry are numbered by millions, it seems improbable that any further change of arm will take place for a long period.

In all probability, therefore, the next great war will be fought out with the weapons now adopted, and it becomes a matter of special interest and importance to learn what we can concerning the battle effect of a weapon which is destined to play such an important part in the wars of the future.

The following table gives the calibres of the various new rifles adopted by the chief European Powers:—

Country.	Rifle.	Calibre.
Germany.....	Mauser	0·310"
France	Berthier.....	0·301
Austria	Männlicher.....	0·315
Italy	Vetterli.....	0·409
Turkey	Mauser	0·433
England	Lee-Netford.....	0·303

The Russians have not yet, I believe, made a final selection; their delay is due to unsettled points regarding minor items of mechanism, chiefly of the magazine. The principle of reduced calibre and lighter ball will be maintained in whatever weapon they finally adopt.

The question then which presents itself is, "What will be the effect in battle of a rifle missile, small, light, hard, and pointed, travelling at a very high rate of velocity, compared with our past experiences of a larger, heavier, and softer ball, propelled with more moderate velocity?"

To answer this question it will be necessary to examine *seriatim* each particular in which the new magazine bullet differs from those of other rifles used in the past decade. It will be sufficient to confine the enquiry to our own Army, and notice those differences in the projectiles of the Snider, the Martini-Henry, and the new Lee-Metford rifle which might be capable of modifying their effect in battle.

The missiles of these three arms differ in respect of length, weight, diameter, composition, and velocity of flight.

The subjoined table shows these particulars as regards each weapon:—

Rifle.	Length.	Weight.	Diameter or calibre.	Composition.	Velocity (muzzle).
Snider.....	1'04"	grains 480	0'577"	Pure lead	1,240 ft. per sec.
Martini	1'27	480	0'450	Lead & tin (1:12)	1,315 "
Lee-Metford.	1'25	217	0'303	A core of lead and antimony covered by a thimble composed 80 parts copper to 20 of nickel	1,800 to 2,000 ft. per sec.

Barrel calibre and diameter of corresponding ball may be taken as practically identical, and the two terms used the one to express the other. The difference between them is so fractional that for our purpose it may be disregarded, and a rifle having a calibre of 0'303 may be taken to propel a missile 0'303 of an inch in transverse diameter; or one with a calibre of 0'450 to have a corresponding bullet of 0'450-inch diameter.

A small variation in the length of conical rifle balls is not generally material to the question of the effects that they produce on impact. Unless such bullets are deviated from their course by accidental circumstances, as a ricochet, the line of flight is point first in the direction of the long axis, with a rotation transverse to that axis. Penetration being effected, the length of metal behind to pass along the track, provided the regular line of flight be maintained, does not increase the size of that track. A hole in a plank, made by a bullet striking it, would not be increased in size by passing a leaden bar a foot long through it, provided the diameter of the bar was not greater than that of the ball, and that its passage were effected in the line of its long axis. Variations in lengths of conical balls may therefore be disregarded when considering their relative effects on impact.

Weight of projectiles is the next point of difference. Those of the Martini-Henry and Snider are identical in weight, being each 480 grains (avoirdupois).

The Lee-Metford ball weighs only 217 grains. In other words, one Martini bullet weighs 46 grains more than *two* of the magazine rifle.

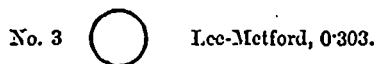
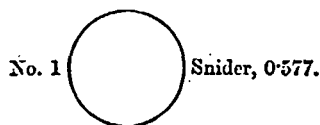
Sir Thomas Longmore, in his work on "Gunshot Wounds," published fifteen years ago, remarks as follows: "The power of destruction of small projectiles is increased according as their weight is increased, form and other things being equal, especially when they are brought into contact with the *hard* structures of the body, is of course an obviously correct principle, but it is questionable whether there can be such difference in weight among the rifle projectiles, which are likely to be issued for military use, as to make the variations of any great practical importance as far as the wounds inflicted by them are concerned." Surely "*tempora mutantur.*" The differences in weight taken cognizance of by Sir Thomas Longmore were those where the variation lay between 400 grains and 600 grains. When the above words were written by the eminent Netley professor, no military authority, however advanced, conceived it possible that in so brief a time the weight of the small-arm projectile throughout Europe was to be reduced by more than one-half; yet such is an accomplished fact. So material a difference can no longer be disregarded, and we have now to consider as a very serious question what modifications in destructive effect will be brought about in battle by the use of so light a bullet.

The object in war, as carried on between civilized nations, is rightly understood to be the placing of antagonists *hors de combat*. It is, theoretically, not necessary to kill. We endeavour merely to disable our enemies individually and collectively; but the disabilities inflicted should, under all circumstances, be at least grave enough to prevent the injured from taking any further part in the campaign; and against cavalry it is desirable that the shock of the wound should be sufficient to immediately stop further progression of horse and rider. All sportsmen experienced in shooting large game understand the necessity of immediately stunning a wild animal. It is no use inflicting a wound which has no immediate stopping power on an animal, though it may subsequently prove mortal. Every tyro in Indian sport knows that to wound a deer, even through the body, with a small ball will, in all probability, only hasten the animal's flight, and preclude the chance of it being added to the bag. A tiger hit in like fashion, though it may be in a mortal spot, will become, *temporarily* at all events, an infinitely greater source of danger to the sportsman than if it were left unwounded. Rash, indeed, is the man who follows up dangerous game unless he be armed with a weapon which is capable by the great shock from its missile of immediately dropping the animal that is being pursued.

It becomes evident from all considerations bearing on the subject that, by the material reduction which has been effected in the weight of our Army rifle bullet, we have sacrificed stopping power to a very

great extent. It may be contended that this is re-supplied by increased velocity. No doubt loss of power on impact caused by loss of weight may, when the missile is used against any solid *resisting* body, be made up again by increased velocity. But rifle bullets in battle are designed for use, not against resisting objects such as iron plates and stone walls, which from their resistance sustain the entire moving energy of the projectile, but against the soft and comparatively non-resisting structures of which the fleshy bodies of men and animals are composed. Against them increased velocity of bullet means (within certain limits) only increased facility for their passing through the tissues. Even with yielding structures, provided the size and volume of missile remain the same, loss of weight can, I admit, be made up for by increased velocity. But in the instance of the magazine rifle bullet, we have a missile which is not only less than half the weight of its lightest predecessor ever used in our Army, but at the same time is little more than half the size. We have, therefore, to deal with not only decreased weight but also decreased size, or, what amounts to the same thing, diminished transverse diameter of the ball.

For purposes of comparison, a representation of the exact area at the bases and transverse diameters of the Snider (No. 1), the Martini-Henry (No. 2), and the Lee-Netford missiles is given in the accompanying diagrams.



In this way it is brought forcibly home to us how great a sacrifice we have made in size in adopting the magazine rifle. We see that the Lee-Netford ball has a destructive area on impact of very little more than that of the Snider, and its diameter is 0.147 of an inch less than that of the Martini. Such a reduction must necessarily

decrease the size of a wounded area produced by the ball on striking the body. The resisting surface being thus reduced, the ball penetrates and passes through the tissues without having expended much of its energy in their destruction. Its track is so narrow that there is practically no destruction of substance in its wake. Such a ball might pass through a large joint without touching the bones, or between the two bones of the fore-arm or leg without injuring them in the slightest, thus producing nothing more than a simple flesh wound, not grave enough to place the wounded man *hors de combat*, and from which he would, with skilled surgical attendance, probably quite recover in a few weeks. A Martini or Snider ball striking in similar situations would inevitably shock the system and shatter the bones to such an extent as to totally disable the soldier for many months, if not for life. In adopting a lighter and smaller ball we have, therefore, sacrificed to a great extent the stopping power and shock possessed by the larger missiles. Impact shock produced by the magazine bullet is also further mitigated by the fineness or sharpness of this missile's point. It is obvious that for penetrating soft bodies the smaller the point the less is the degree of resisting surface to be overcome by the missile in striking. Penetration is effected by a smaller expenditure of moving energy, and the ball passes completely through structures without having parted with much of its *viva*. In other words, the projectile retains its moving power and expends it on further flight, probably to prove only abortive, instead of having first parted with sufficient force to perform its work on the first object struck. Passage through the tissues of the body is further facilitated by the rapid rotatory movement round its long axis which is the property of all moving rifle bullets. The long axis being maintained in the line of flight, it follows that any rotation round that axis must aid in screwing the point onwards and facilitate the penetration of a moderately resisting substance. It is accepted as an axiom in the theory of projectiles that "velocity of rotation increases penetration;" it is, therefore, obvious that a narrow, pointed missile, rapidly rotating, must penetrate the body and pass through the tissues without causing as much damage as a stouter and blunter one. The advantages which might be derived in battle from the increased penetration and accelerated rotation of the 0.303 bullet are much discounted by the diminution of its shocking power, the result of decreased size and sharp point, qualities which doubtless enable the missile to pass through the tissues of the body with less expenditure of energy and consequently with less destruction to the parts traversed. In other words, the great penetrating power of the 0.303 ball is likely, in many instances, to prove an abortive surplus, purchased at the expense of a decreased destructive power. It is true that a ball after having traversed the body of one man has still enough energy left to pass through that of a second or even a third individual, and might possibly do so on exceptional occasions, but that such is likely to happen frequently enough in battle to be counted on as an advantage seems improbable, owing to the open formation of the modern attack. The fact, at any rate, is one of some

importance to those who are concerned with field tactics, and may be suggestive of further changes in this respect.

The next point in the Lee-Metford bullet which is likely to modify wounds produced by it is its composition. The ball (as shown in the diagram) consists of two parts, a core of lead (slightly hardened



by an admixture of antimony), outside of which is a hard, inelastic, coherent, metallic casing or thimble, made up of an alloy of 80 parts of copper to 20 of nickel, having a surface as smooth as polished steel. The effect of this cohesive and inelastic jacket is to entirely prevent any splintering, flattening, or breaking up of the missile on contact. Expansion and splintering are such marked features of the Snider ball (which, be it remembered, is made entirely of soft, pure lead, with a hollow base), that it almost comes within the category of explosive bullets. The ball of the Martini being smaller than that of the Snider, and being composed of lead hardened by an admixture with tin, the breaking up and opening out of the metal on contact is prevented to some extent. With the hard, cohesive Lee-Metford missile splintering may be regarded as practically abolished. It will penetrate and traverse the *soft* tissues of the body as a solid steel missile would do, without becoming flattened or opened out; or indeed suffering any material indentation or alteration in shape. So long as the ball meets with nothing in its course of a hard resisting nature, the wounds will be of a very simple character. Should the missile come into contact with the dense compact tissue of the shaft of a large bone, such as that of the thigh, which has sufficient resistance to cause the ball to expend its full moving energy, it is probable that much damage will be done, and that the resisting bone will be shattered. This does not, however, apply to the more expanded extremities of bones; being made up of soft cancellous tissue, they will be easily perforated, and will not sustain much further injury.

To instance the very hard character of the Lee-Metford ball, I may say that I have one in my possession which, fired at the 800 yards range, ricocheted either from off the top of the target or from the ground near it; having travelled for another mile, it again ricocheted from the surface of some water; it then struck a labouring man and passed completely through the thickest part of his thigh and groin, and finally buried itself in the ground near by. This missile is not

flattened, or in the least altered in shape; its point is not blunted, and practically it bears no sign of having come into contact with anything. It is, therefore, easy to understand how simple will be the character of injuries inflicted by this ball on the body. Even if we leave out of the question for the moment the smallness of size, compared with wounds produced by other bullets, there is the undoubted fact that, on account of the great penetration and perfect cohesive qualities of the ball, wounds produced by magazine rifles will not, under ordinary circumstances, be complicated with the lodgment of the whole or of any portion of the missile; thus, the most troublesome and tedious consequences of gunshot injuries which military surgeons have hitherto had to contend with will be abolished. Some experiments which were made on the bodies of horses when the rifle was first introduced did not, I am aware (especially when bone was struck), result in the production of wounds so simple in character as the ones I have anticipated. It was then thought that the injuries produced by the Lee-Metford ball would indeed be more severe than those of the Snider or Martini. But these trials have become valueless, as they were carried out with an ammunition which was quite different from that now in use. In many of these cases, breaking up or splintering of missile was brought about by the soft leaden core "stripping," or making its way through the hard thimble surrounding it. Such an occurrence was common enough with the imperfect ammunition as first supplied. It is well known to all who used the rifle in its early days that this "stripping" in many instances took place even before the missile left the barrel. It was then not at all unusual for the hard thimble to remain impacted in the grooving of the barrel, whilst the core of soft lead passed on to its destination alone. But the missile has now been so altered and improved that it is almost impossible for the core to pass out of its casing, and we may take it as practically certain that there will be no flattening or breaking up on contact, unless the amount of resistance encountered by the ball is sufficient to overcome that of its hard casing, an eventuality which can only happen in the human body when the dense portions of the compact tissue of the largest of the long bones are struck.

The various properties of the Lee-Metford missile which are likely to influence the character of wounds produced by this projectile have now been severally examined, as also the points of difference between it and the missiles of the Snider and the Martini rifles. To shortly recapitulate: a rifle missile has been adopted which is lighter, smaller, harder, more pointed, more cohesive, and which travels at a greater velocity, than any other bullet previously used. From these changes it seems certain that the following modified effects are likely to accrue:—

1. Diminished shock and stopping power on the individual wounded.

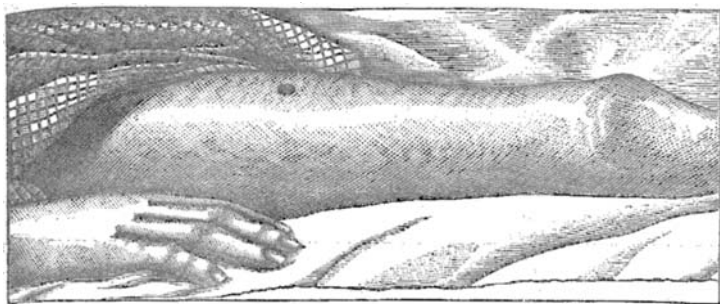
2. Wounds clean cut, much decreased in size, and with very little destruction of the parts traversed by the ball.

3. Wounds uncomplicated by the lodgment of the ball, or by splinters of lead, or any foreign body.

4. Union of wounds by the "first intention," and rapid recovery of the injured.

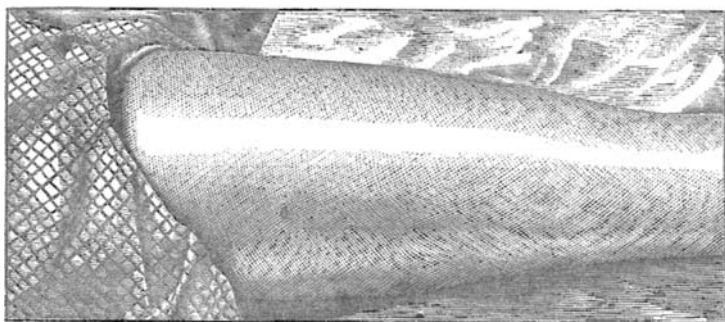
That the effects of small arm projectiles now adopted by the Great Powers will be of the modified nature before indicated are fair conclusions, drawn from a comparison of their destructive powers with those of the older weapons. But did these conclusions rest on inference only, however logical they might appear, it could yet be said that they remain in the limbo of doubt, requiring the confirmation of actual proof before they can become accepted facts. It is true there has not been any extended experience of wounds inflicted by these rifles. Nothing less than the actual test of war will enable us to accurately gauge their power under all circumstances. Yet we are not totally without experience of what the weapons will do; a few cases have occurred of men being accidentally wounded by the 0.303 magazine ball; each of these affords such astonishing proof of the correctness of the deductions arrived at that there can no longer be any reasonable doubt that a very large proportion of wounds in future campaigns will be of the mitigated nature anticipated. I am in possession of the particulars of two such cases. One occurred at Aldershot, and came under my own observation; the other happened at Woolwich, the particulars of which have been supplied to me from the records of the case. These two cases are so instructive, and afford such clear evidence of the diminished wounding power of the rifle, that I am tempted to supply a short abstract of each of them.

Case No. I.—On 19th February, 1890, a labouring man, aged 36, was at work loading a cart with gravel in rear of the rifle ranges at Aldershot, when he was shot through the right thigh by a bullet from the 0.303 magazine rifle. The missile which struck him, had travelled about 1 mile and 800 yards, and had ricocheted from the surface of some water close to him, as well as probably also from the edge of the target or something near it. He was not knocked down immediately on being struck. I saw him one hour after receipt of the injury, and found him comfortably lying down in his cottage, and not suffering in the least from shock or from any urgent symptom, the normal characters of the pulse, respiration, and temperature being undisturbed. There was no hæmorrhage from the wound, and it caused him only slight pain. He said that when struck it merely felt as if he had been pricked through the skin with a penknife. The entrance wound was situated over the front of the middle of the thigh. It was slightly oval in shape, $\frac{3}{8}$ of an inch one way and $\frac{2}{3}$ of an inch the other, and looked like a clean punched out bit of skin. Bruising extended from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch round it. The direction of the track was upwards and backwards, and apparently in a direct line for the bone, the periosteum of which must either have been grazed or was within a fraction of an inch of being so. The bone, however was not injured. There was so little destruction of tissue in the track that a probe would only pass into it for $1\frac{1}{4}$ inch. Exit wound was situated at the back of the middle of the thigh, just $\frac{1}{2}$ an inch below the fold of the buttock. It was merely a clean cut, transverse, slit in the skin without any loss of substance round it. Length, $\frac{1}{8}$ of an inch. It looked



(From a photograph of the wound of entrance taken 20 hours after the injury.)

as if a sharp, thin-bladed knife had been thrust into the flesh, and it was so unlike any bullet wound I had ever seen before that at first I could hardly credit its being one.



(From a photograph taken 20 hours after the injury, showing posterior aspect of the thigh with the exit wound.)

The wounds were treated antiseptically, and they rapidly healed. The man progressed very well and made an uninterrupted and rapid recovery. The whole track and aperture of exit united immediately by "first intention." The punched out bit of skin at the entrance wound rapidly filled in (without suppuration), and was cicatrized over by the fourteenth day. Twenty-four days after the injury the man could walk well again, and was discharged from hospital. There was no wasting of the limb, only slight stiffness on walking being felt. Some days after returning to his own home the man unfortunately contracted acute bronchitis and pneumonia, from the effects of which he died, thirty days after his discharge from hospital. A post-mortem examination of the injured limb was made, and the only indications of the bullet wound then seen were the surface cicatrices. The entire track was so united that it was found impossible to trace the course the missile had taken.

It may be of further interest to mention that the 0.303 bullet which wounded this man was found partially buried in the ground, just beyond the spot where he was standing at the time when struck. It was not splintered or damaged in any way.

Case II.—A Woolwich Arsenal operative, aged 51, while stooping down engaged in mending the bottom of a target at the Arsenal trial ranges was struck behind by a bullet from the 0.303 rifle, fired at about 100 yards from him. The ball passed completely through the upper end of the left thigh, entering posteriorly on the inner side, immediately below the fold of the nates, and making its exit on the anterior aspect of thigh, very close indeed to inner side of the femoral artery. The wounds of entrance and exit were of comparatively small size. They were both slightly ragged; some contusion extended around them, but the amount of tissue absolutely destroyed was almost *nil*. The man was not knocked down when struck. No hæmorrhage or shock resulted from the injury, and there were no urgent symptoms. The wounds were brought under immediate antiseptic treatment, and they rapidly healed without pus formation or any complication. The man was discharged to his duty thirty-two days after receipt of the injury.

These two cases are very similar; both afford striking proof that the modifications which have been introduced in the missiles of modern rifles have considerably diminished the wounding power of the small arm. In each case a man was shot completely through the largest part of the upper portion of the thigh, yet in neither instance was the wounded man knocked down, nor did any shock result. If these men had been on service, Case No. I would have returned to his place in the ranks in twenty-four days and Case No. II in thirty-two days. Had the ball been the same size as that of the Martini, i.e., $\frac{1}{4}$ -th inch larger in diameter, or, indeed, only a small fraction of an inch greater in transverse diameter, in Case I the femur would inevitably have been fractured, and in Case II the femoral artery opened. In both cases the small, hard, cohesive missile traversed the tissues of the body, going in and out again, without expanding or splintering, causing no lodgment of foreign body, and with little or no destruction of the parts in its track. In both instances the wounds healed rapidly by immediate union. Up to the introduction of the present form of missile this event was of such an extremely rare occurrence in the history of gunshot wounds that Sir Thomas Longmore (one of the most experienced authorities) doubts if it really ever occurred.

It has been shown that if wounds were inflicted by Martini or Snider balls in similar situations of the body as those cited in the above cases, the results would be very severe, and if not costing the wounded man his life would, at least, end his career as a soldier, and necessitate many months of treatment in the recumbent posture. From the increased range, lower trajectory, and more rapid firing power of the new rifles the number of wounded will, doubtless, in every conflict where these weapons are used, be very large and much exceed the average of what was obtained in battles up to the present date. But, however much the power of the small arm may be increased

with respect to augmenting the total number of wounded, it is highly probable that a very large proportion of the wounds will be of a mitigated nature. Wounds of the skull will, doubtless, prove as fatal with the 0.303 ball as with any other; but combined statistics of recent wars show that only about 12 per cent. of the total number of those wounded are struck in the head. From the low trajectory of the magazine rifle the proportion of wounds in this region may become somewhat increased, but a slight gain in this respect is outbalanced by the diminished effect the ball has when striking the limbs of the body; the proportion of wounds in the extremities amounting to no less than 65 per cent. of the total number of those wounded. We may safely reckon that in the next campaign the Medical Department will have to deal, after every action, with a much larger number of wounded than has hitherto been the case, and of these a great proportion will consist of slight injuries. If early and efficient treatment be at hand in field hospitals these cases will be sufficiently recovered to allow the injured to rejoin the ranks again in a few weeks. Such satisfactory results, however, can only be attained by bringing the wounded at once under treatment. A few hours' delay before the patient comes into the hands of the surgeon is often enough to preclude all chances of obtaining immediate union in a gunshot wound, and of maintaining it aseptic. It is, therefore, absolutely necessary that the treatment of the wounded should begin on the field at the earliest possible time after their injuries have been received. It has become a time-honoured principle to remove the wounded to the rear and towards the base for treatment as speedily as possible after an action. For this purpose they must be transported from the field hospitals to the stationary hospitals on the lines of communication, and passed on thence to the base, step by step. It is questionable whether this system of hurriedly evacuating wounded towards the base will be the best one to adopt in future campaigns. No doubt military exigencies may, on occasions, demand such a course, but ordinarily it appears that greater advantage will be derived from pushing a large number of field hospitals well up to the front, and thus bring the hospitals to the wounded, as well as the wounded to the hospitals.

What is most likely to be felt in future campaigns will be the want of moving hospital accommodation, where the *entire* treatment of a large proportion of the wounded may be carried out. According to present Army establishments, a British army corps, of approximately 36,000 men, taking the field would be provided with only 10 movable field hospitals, able to accommodate 100 patients in each, and of this number 3 are held in reserve, so that the total proportion of movable hospital beds available is 1 to every 36 men, or exclusive of reserve about 1 to 50.

These provisions would probably have proved adequate under the former principle of rapid evacuation of wounded towards the base, but since the great changes that have taken place in the infantry arm of European nations it has now become a serious question for consideration whether our movable field hospital accommodation, as provided for under existing regulations, will prove adequate in the

coming day of need, and whether it will not be advisable to make provision for the *entire* treatment of a large number of cases in the field hospitals at the front. By this method only will all unnecessary loss of strength in the fighting line be obviated, to say nothing of the great sufferings and inconveniences attending transport of wounded over long distances towards the base. The system also for rendering first aid to and removal of the wounded from the field of battle by trained bearer companies, as provided for under present regulations of the Medical Department, is an admirable one; but for future campaigns the number of bearer companies allowed to each army corps, and the strength of each individual company, will require a considerable augmentation if we wish to provide for the increased requirements which may reasonably be expected in future campaigns.

I trust that the foregoing pages will not be looked upon in the light of an adverse criticism of the Lee-Netford rifle. Nothing could be further from my intention. Competent authorities declare the weapon to be an admirable one, and it has been approved as our infantry arm; it would, therefore, ill become any Officer in the Service to offer criticisms on what has received official approval. My endeavour is to show what may reasonably be expected to result in future campaigns from the introduction of magazine rifles in general, rather than to criticize any one arm; for, be it remembered, the adoption of quick-firing guns, carrying smaller and lighter projectiles, has been a universal change throughout the armies of Europe, and not peculiar to our own. Military considerations, such as facility for supply of ammunition in the field and the great increase in effective range, will far outweigh any minor deficiencies in the new weapons as wound producers. Successive changes in armament have always necessitated alterations in tactics; it is for the authorities concerned with those matters to say what modifications in field tactics will result from the universal introduction of magazine rifles. Many questions present themselves; I do not purpose to deal with them. Such matters as the advisability of deploying from column of route at very long distances from the enemy, and of using every endeavour to prevent cavalry approaching unbroken to within charging distance of infantry, are such self-evident necessities that they must be apparent to all.

Military exigencies demand that the new form and condition of rifle missiles shall be retained with all their advantages. It is for practical gunmakers to solve the question whether it will be possible to remedy their chief defect of diminished impact shock on the body without sacrificing other material advantages.

ADDENDUM.

Since the foregoing pages were written, I have been able to ascertain the following particulars of the Berthier magazine rifle, with which the French Army is now being equipped :—

Calibre.....	0.301 inch.
Diameter of bullet....	0.308 "
Length " 	1.142 "
Weight " 	205 grains.
Muzzle velocity.....	2,071 feet per second.
(Smokeless powder.)	

The bullet is made of a core of hardened lead surrounded by a casing of white metal.

It is thus seen that the missile of the Berthier rifle is very similar to that of the Lee-Metford; in fact, the difference in calibre of the two weapons is so fractional that the 0.303-inch ammunition may be used for both.