MODERN FIREARMS.

ADDRESS BY CAPT. J. CHARLES MACDOUGALL, R.R.C.I., BEFORE THE MONTREAL MILITARY INSTITUTE.

MAJOR J. E. IBBOTSON, Royal Scots, took the chair in presence of a crowded room, when Capt. Macdougall delivered an address before the members of the Montreal Military Institute on "Modern Firearms." He said:

About the year 1848 the Prussians adopted the breech-loading needle gun. This fact does not seem to have been regarded as important by the other European powers, who at that time were armed with muzzle-loaders, and so remained. It was not until the Danish war of 1864, and the short and decisive campaign of 1866 against Austria, that the superiority of the Prussian breech-loading rifle over muzzle-loaders and the advantages of rapid fire were fully demonstrated.

In England, after this, it was felt that no time should be lost in providing the army with a breech-loader. In June, 1864, a committee of officers assembled to consider and report upon the expediency of introducing breech-loading arms for general adoption in the army. After a few sittings the committee unanimously recommended that the system be immediately introduced. It was decided to convert the then existing stock of Enfield rifles into breech-loaders, and gunsmiths and manufacturers were invited to send in patterns of the modes in which they might propose to carry out the conversion. Nearly fifty methods of conversion were proposed, and the committee, after many and protracted experiments, recommended the plan proposed by Mr. Jacob Snider.

It was recognized in England at that time that what the army needed was a breech-loader using a metallic cartridge, which had not been adopted up to then by any foreign power. The principle of small arms was in a transition state, and it was decided to convert the muzzle-loading rifles into breech loaders using metal cartridges and to await the development of invention before adopting an entirely new arm. The whole stock of Enfields was converted on this principle and was exhausted before the question as to the future arm was settled, and a number of new arms on the Snider principle (but with steel, instead of iron, barrels) were also made. Thus it is seen that the Snider-Enfield was never intended for anything but a make-shift. The Prussian campaign of 1866 against Austria, in which the former had breech-loaders and the latter muzzle-loaders, proved conclusively the immense superiority of the breech-loader, and Europe generally proceeded to re-arm upon that principle.

The British army, being for the present armed with a breech-loader, the question of the best arm for the future was taken into consideration. A special committee was appointed for the purpose in October, 1866, and proposals were advertised for. Although about 120 arms were submitted, none were approved by the committee, owing chiefly to the fact that accurate shooting had not been considered by the manufacturers so much as ingenious methods of closing the breech. None of the arms submitted had reached the standard of accuracy laid down by the War Office, a standard that could, it was known, be readily surpassed by muzzle-loaders unde similar conditions, and which, it was thought, ought to be attainable by breech-loaders. It was also clear that the closing of the breech by one system of mechanism or another, if metal cartridges should be used, could not affect the accuracy of the arm, unless it precluded the use of a cartridge of suitable size. The questions, therefore, of bullet, bore, grooving, weight and description of barrel, charge of powder, and cartridge case, could be settled independently, and, having determined these points, it was considered that a decision on breech mechanisms would be more easily arrived at.

Before deciding their plans, however, the committee consulted many experts in the matter of small arms, and, supported by their opinion, separated the question of the barrel from that of breech mechanism. It was decided that the barrel competition should be confined to those systems of rifling which had been most satisfactory as muzzle-loaders, and that the breech action competition should be, so to speak, "open to all comers." After careful and elaborate trials, the committee, in 1869, reported in favor of a combination of the Martini breech-block and the Henry barrel, or the Martini-Henry rifle, which we know so well. After many tests and trials, discussions as to the cartridge, and the taking of evidence of eminent civil engineers as to the mechanical construction of the breech action, the rifle was finally approved in April, 1871,—five years after the subject had first been submitted to the committee.

The following are some of the particulars of the rifle:

Weight of rifle without bayonet	8 lbs 12 oz.
Length of rifle (long butt).....	4 ft. 1½ in.
Weight of bullet (over 1 oz....	480 grs.
Weight of 1 packet of 10 cartridges	1⅛ lbs.
Mean muzzle velocity	1315 f s.
Greatest height of trajectory above line of sight for 800 yds., culminating at 500 yds.....	26.59 ft.
Bore	.45 in.

The barrel is made of solid steel, and it is rifled with seven grooves having a right-handed uniform twist, and making one complete turn in 22 inches. The body contains the breech action—which is the mechanism for closing the breech, firing the cartridge and extracting the empty cartridge case. The breech is closed by a block which swings on a pin, passing through its upper rear end and the upper rear end of the body, but is so arranged that the recoil is taken by the back and sides of the body and not by the pin. The cartridge is fired by the striker, which is driven forward by the action of a strong spiral spring within the breech-block. The action of lowering the lever causes the block to fall and to strike the extremity of the lower arm of the extractor, thus ejecting the empty case. With the same motion, and at the same time, the action is cocked, the striker drawn back and the main-spring compressed.

The action of the extracting lever is so arranged as to give its greatest power at the commencement of the extraction, when the cartridge has been somewhat hammered into the chamber by the action of the striker on its base and expanded by the explosion, and its greatest velocity at the end to jerk the empty case out. It is evident that the constant falling of the block upon the extractor tends to flatten the latter. When this flattening has taken place the extractor loses its leverage on the empty cartridge, and this has been the chief cause of failures in extraction, erroneously attributed to the cartridge. In this connection Major Mayne, in 1888, wrote:

"There is a strong opinion * * * that we made a mistake in 1870 in adopting the falling block breech action for our rifle, not so much on account of its unsuitability for magazine purposes, the future use of which was not then realized, but on account of its inferior mechanical power for loading and extracting. Mechanically speaking, the direct action of a bolt for both loading and extracting is far superior to loading with the thumb and extracting with the indirect action of a lever operated on by a falling block, as we have in our present rifle. We have lately frequently heard from the Soudan of the want of extracting power that exists in our rifle for ejecting cartridges that have stuck for any reason. With a bolt breech action these complaints would not have occurred unless the base of the cartridge tore away from the body of it, an occurrence which is not likely to occur at any time if a good design and manufacture has been ensured. Further, a solid-drawn cartridge case is known to require a stronger extractor than the rolled sheet brass ones that we use, as the expansion of a solid-drawn cartridge case when fixed is more permanent than that of a rolled one, and this is another reason for introducing the bolt breech action in any future rifle for our service. Arguments have often been used in England against a bolt breech action on account of the frequent failures of the Prussian needle gun and the French chassepot in the Franco-German war. Metal cartridges were not used with these weapons, and the breech was so badly closed that a large escape of gas occurred when each cartridge was fired. The consequence was