Department undeserving of a word of praise for the manner in which this battalion was thus speedily sent forward, although its services were ultimately not required. Every article of their accoutrements and clothing, rations, camp equipments and ammunition was either on the train with the battalion, or, as in the case of underclothing, socks and boots, provided for *en route*. And when assembled in camp, representing as the men did, the varied industries of the province, as well as the different corps, Infantry School, city and country militia, it was marvellous how smoothly the whole machine worked—the following lessons remaining when the corps quitted the camp at Sussex to return home, not being required to take part in the operations in the field with their more fortunate brethren in the west.

1. The loyalty of Canadians east and west when put to the test; differences of opinion and grievances, real or imaginary, are scattered to the winds—united action, as a thing of necessity, remains.

2. The wisdom of the establishment of schools of infantry as a continuation of the artillery branch of the permanent force. In this case, it will be observed, the School of Infantry was the foundation of the speedily formed battalion, and its machinery, from the commandant downwards, served to complete the internal arrangements of the corps, each individual member of the permanent corps serving as an example in drill, in military bearing and in the manner of performing duties.

3. The necessity for care being taken "not to develop the head at the expense of the feet." Here city and country corps were serving side by side, each having its work to do, each man doing honor to his country. And as the General, of whom we are so proud, would not dream of extending for attack any force under his command without keeping well in hand "fighting line," "support" and "reserve" (apart from all other questions of offence and defence), neither will our authorities lose sight of any part of our Canadian organization, but will trust in a combination of our permanent force our city corps and our rural battalions.

RIFLES AND RIFLE SHOOTING.—VI.

BY CAPTAIN HENRY F. PERLEY, HEADQUARTERS STAFF.

A musketeer's hat was rather an important affair in "ye olden tyme," for it is said "Every musqueteer should know how to carry his "match dry in wet weather, by putting the lighted match between his "head and his hat, etc." This hat, as would appear from an English Manual, published by royal command in 1690, was further utilized thus: "Instruction 24: Take with your right hand some of the wad that "sticks between your hat and hat band; tell slowly 1, 2, and bring the "same as you did your bullet, to the muzzell, etc."

The fusil was a successor to the musket. It was shorter and of less calibre, consequently was a handier weapon. It was fitted with a flint lock, and was fired from the shoulder, whereas the musket was fired from the breast. The term fusil was for brevity pronounced fusee, which name it retained as well as the lighter firearms borne by all sergeants of infantry after the suppression of halberts, and until the issue of Enfield rifles in 1853. The company officers of the Fusilier regiments, and those of the flank companies of all other regiments carried fusils after the discontinuance of spontons.

The barrel of the old musket, or "Brown Bess," was derisively called "an iron tube but little better than a piece of gas piping, plugged "at one end." To allow of facility in loading, the bullet was made smaller than the bore, and it fitted so loosely that it dropped freely down a clean barrel to the breech. This difference between the diameters of the ball and the bore was the cause of a great amount of windage, and caused a great loss of propelling power from the escape of the gas formed by the explosion of the powder. The difference between the calibres of the ball and the barrel was also the cause of the erratic shooting for which "Brown Bess" was famous, for the ball, instead of being propelled in a strait line along the bore, rebounded from side to side, and generally took the direction in its flight due to the last rebound when leaving the muzzle. Another cause of its wild shooting was the use of *cast* balls. It has been found nearly impossible to cast a ball which should be perfectly solid or homogeneous, a cavity or air-hole is almost invariably found to exist; and according to the part of the ball in which it may be found, so the position of the centre of gravity would be affected, which of itself was sufficient to cause the eccentricity in its movement alluded to. So bad were the capabilities of this weapon that a gallant veteran once observed that "he believed a man could safely sit "in a chair 200 yards distant from another, who might blaze away at "him all day with one of these muskets, on the sole condition that he "should be bound, on his honour, to aim carefully at him every time."

The French musket was a worse weapon, for whilst 1 ball in 470 fired from "Brown Bess" took effect, it has been computed that, during the wars of the Revolution and Empire (1790 to 1800), 9,000 cartridges were fired for every enemy killed or wounded; and it may not be out of place here to state that at the battle of Cherubusco, the Mexicans killed or wounded one American soldier for every 800 balls expended; and in turn the Americans killed or wounded one Mexican for every 125 balls fired. During the Russo-Turkish war of 1878 the Turks are reported to have lost nearly 150,000 in dead and wounded, and, from the returns, the expenditure of small arms ammunition by the Russians was 67 rounds for each man placed *hors de combat*, not taking into account the effects produced by the artillery, though the proportion of the latter was as 1 to 49 rifles.

With the invention of the rifle, and teaching the soldier how to shoot, wars have become more bloody and the loss of life greater than before, and it cannot now be said, as in the days of old, that every enemy killed or wounded cost his weight in lead, or ten times his weight in iron when killed by artillery.

The invention of rifling a gun barrel has been attributed to Gaspard Zoller, or Zollner, of Vienna, about the end of the 15th century. As originally practised it consisted of ploughing a number of straight grooves or channels from the breech to the muzzle, simply to allow of facility in loading, and to afford an opportunity for the deposition of fouling without a diminution of the bore. Probably by accident, or from fancy, a certain degree of spirality was given to this grooving, which was found to add to precision in firing. Koster, of Nuremburg, is said to have been the first who, in 1520, adopted the spiral grooves in the rifles manufactured by him. For many years rifles were only esteemed as curiosities or used for amusement; and though in 1680 each troop of Life Guards was supplied with eight rifled carbines, it was not until 1800 that the 95th Regiment, now the Rifle Brigade, was armed with a rifle known as "Baker's Rifle," which had only two grooves, and carried a spherical ball having a band around it which in loading was placed in the grooves.

In the Artillery Museum at Paris there is a collection of old rifles, and amongst them a great variety of grooving is to be found. Thus:—

19 have straight grooves.
131 " grooves uniformly inclined.
87 " an increasing twist near the breech.
29 " " " towards the muzzle.
83 " " " " middle of the barrel.
67 " grooves making half a turn and under in the length of the barrel.
219 " grooves making from half to a whole turn in the length of the barrel, and
55 " grooves making from one to two entire turns in the length of the barrel.

The theory of rifling a barrel is that the position of the axis of rotation of the bullet not being dependent upon any accidental circumstances, but being rendered coincident with its line of flight, the resistance which the fore part of the bullet encounters from the air acting equally on all sides, is evenly distributed around the centre of gravity. If, moreover, there should be any irregularites in the surface of the bullet, its rotation on its axis presents them successively to the action of gravity and the air, and thus neutralizes the deflection to which these defects give rise.

Up to the present the long and short Enfield is the only rifle placed in the hands of the Active Militia of Canada. Though there are a number of Martini-Henry's in the Dominion, no regular issue has been made. The "long" Snider is 54 inches in length, and weighs without the bayonet. 9 lbs. 12½ oz. The barrel is 39 inches in length, ·577 inches diameter of bore, grooved with three grooves, which make one turn in 78 inches, or half a turn in the length of the barrel. The Martini is 49 inches in length, weighs 8 lbs. 12 oz., is ·45 inch diameter of bore, grooved with seven grooves, which make one turn in 22 inches.

Originally all rifles were loaded at the muzzle, but as soon as they were recognized as an arm of precision, attention was called to the advisability of simplifying and accelerating the operation of loading, and this was done by inserting the charge at the breech. The invention of breech loading dates back to 1500, and a description of many curious specimens will be found in "The Gun and its Development" by Greener. Many years ago the Prussians adopted into their service the "needle gun," and their successes against the Danes, Austrians and French, were attributed in a great measure to the rapidity with which their troops were enabled to fire upon the enemy. In the British service the first use of breech loaders was to arm the cavalry, as it was a matter of importance to simplify the operations of loading on horseback, and in 1857 some Sharp breech loading rifles were issued to the regiments. The charge for this arm was inserted bodily at the breech, and as the "block" ascended it cut off the end of the paper cartridge,