

suitable for our climate nor for the services expected of the Militia. The upper part of the body requires to be more loosely and coolly, the lower part more stoutly clad. Respecting headdress we have already said something, and we venture to hope that the motley parades lately witnessed in our streets may have the effect of starting an official enquiry into the whole subject of uniforming the Militia.

We quite believe that part at least of the dilapidation was assumed for the sake of effect, or for the joke of the thing. One gallant officer in particular was noticed with two oatbag patches in the most conspicuous part of his trousers, the round white insertions producing a fine contrast with the black cloth. These garments should command a fancy price from some of the enthusiasts who are engaged in securing souvenirs of the campaign. The young man's first effort at housewifery was not received favorably by his stern parent, who thought it indicated an undue amount of sedentary occupation, and greeted his offspring with an enquiry whether there were not a blacking brush in the battalion with which appearances might have been improved.

We reprint from the *Volunteer Service Review* the ideas of a non-shooting man on the aids now used in target shooting, and commend them to the consideration of our readers without, for the present, making any comment upon them.

All our readers will rejoice to learn that Major-General Middleton, commanding the Canadian Militia, who has hitherto held only Canadian rank, and local rank at home, with substantive rank of Colonel, has been gazetted a full Major-General in the Imperial army. The gallant general is to be congratulated on his promotion, which occurs in the regular order of seniority.

No. 3.—RIFLES AND RIFLE SHOOTING.—XII.

BY CAPTAIN HENRY F. PERLEY, HEADQUARTERS STAFF.

The line down the centre of the barrel of any rifle or gun is called the "axis of the barrel," and is the line a bullet must take in its passage through the barrel; the continuation of the bullet in its flight along this line is called the "line of fire," and this course it would pursue, were it not affected by causes which will be alluded to hereafter. In early times various ideas prevailed respecting the flight of projectiles, and the path they described. First, it was supposed that they were projected straight, and at the end of their flight they fell perpendicularly; second, that they went straight for some distance, thence in a curved line, and finally fell perpendicularly; third, that their flight was curved throughout, but of so slight a nature as to be compared by a writer in the 16th century, to that of the sea; and that they described a parabola, except in so much as they might be diverted from their course by the resistance of the atmosphere.

A bullet is subjected to many influences, both before and after it leaves the barrel of a gun; and each of these influences has a greater or less effect as it varies in circumstances; thus, the action of the gases produced by the combustion of the powder, which is the cause of the motion of the ball, will be varied in proportion to the quantity of powder exploded, the size of the grain, the density due to the pressure the "cake" has undergone in the process of manufacture, and the differences which may occur in the nature and proportions of the ingredients. Or the speed of the bullet is influenced by the friction that arises as the projectile is forced through the barrel, and by the resistance of the air in the barrel which cannot possibly get out of the way as it cannot be thrust aside, and as the speed of the ball is too great to permit the air moving away in advance without undergoing condensation, there must be an increasing compression and a corresponding resistance as the air is driven from breech to muzzle. The resistance due to friction will vary according to the nature of the rifling and rapidity of twist, for deep grooves and rapid spiral offer more obstruction than shallow grooves and slow twist, whilst a spherical ball which only touches in a narrow line at its circumference, moves more freely than an elongated bullet, the resistance from which increases with an increase in length and the depth to which it may have been forced into the rifling. Beyond these effects there is the obstruction which arises from fouling, which varies with the nature and quality of the powder used and the moisture or dryness of

the atmosphere. Another influence affecting the course of a bullet is the "jump" which occurs in the gun before the shot has left the barrel. This "jump" is termed "recoil movement," which, it is stated, receives its initiation as soon as the bullet is set in motion, although the recoil is not complete until after the ball has left the barrel. That this "jump" cannot be of serious importance is evinced by the fact that bullets do reach the points aimed at, and that no practical shot ever makes any allowance for its effects or takes it into consideration when, on a windy day and in a puzzling light, he has to arrange in his own mind exactly what allowance he must make to score a "bull." The resistance of the atmosphere is one of the most potent of the influences that effect the course of a bullet. Were it not for the resistance thus offered a ball would go on with undiminished speed, regardless of distance; and the differences of size, shape or weight, would not matter anything as regards trajectory, for all projectiles starting with the same velocity, would follow the same curve and traverse the same distance. But this curve (trajectory) differs, as velocities differ, and as bullets vary in shape and weight; and also by variations in the density of the atmosphere, and the changes caused by differences of temperature and moisture; and lastly, there is the force of gravity which has a far greater influence than any other in determining a bullet's course, for by reason of this constant force this course is never direct, but always curved, varying in degree inversely as the speed and the distance to be obtained.

Of the force of gunpowder note has been taken; and of the friction caused by the bullet passing through the barrel, the resistance of the column of air contained in the barrel, and the "jump," it may be said, that they amount to but a portion of the greater and it might be said, the only resistances afforded by the atmosphere and gravity, and reference will therefore only be made to these two last forces.

The air, or atmosphere, is a gaseous envelope surrounding the earth, and to its existence is due the possibility of animal and vegetable life; the transmission of sound; the modifying and retaining of solar heat; gradual shading of night into day, and *vice versa*; the occurrence of weather phenomena, etc. In consequence of the action of gravity the atmosphere forms a spheroidal stratum concentric with the earth, and presses heavily on its surface; for if it be supposed that the air be divided into strata or layers, that layer next the earth is pressed upon by all the layers above it, and the particles of air composing it are more compressed than in the layer above, and as we ascend the air becomes lighter, or more rarified. The height of the atmosphere has not been determined, but that it has a limit is evident, and the only result upon which reliance can be placed is derived from mathematical data founded on the duration of twilight, which gives the height to be about 45 miles.

(To be continued.)

THE CANADIAN TEAM AT WIMBLEDON.

The fact that no less than three members of the Canadian team obtained places in the first sixty for the Queen's prize is a sufficient proof of the excellence of the shooting of the Dominion representatives at Wimbledon this year. As a matter of fact, there can be no doubt that the men under Colonel Ross's command form one of the strongest teams Canada has ever sent to this country. Should they succeed in carrying off the Kolapore Cup—which is being shot for as we go to press—their record will indeed be highly satisfactory. As it is, the average scores of the team are higher, we believe, than have been obtained for some years.

The daily doings in camp have not been marked by any special novelty. The weather, on the whole, has been extremely fine, though the wind and light have, as usual, been trying to marksmen, especially to those who, like the Canadians, are for the most part strangers to the Common. Except on Saturday, comparatively few visitors have been received, but Colonel Ross has had the pleasure of receiving, among others, the Princess Frederica of Hanover, and Baron von Pawel Rammingen, Lord Fortescue, Sir Charles and Lady Tupper, Sir Henry Fletcher, and Sir Henry Wilmot, and a large number of commanding officers of volunteer corps. As was only to be expected, the achievements of the Canadian Militia in the North-west have led to a heartier welcome than usual being given to those representatives of the force who have crossed the Atlantic, and who, it may be justly said, have been much gratified by the warm congratulations which have been tendered them upon the prompt suppression of the revolt. Captain Clark, who was wounded in the campaign, is in one sense the hero of the team, and has been much questioned by old and new friends as to his experiences in the field.

On Saturday the Duke of Cambridge paid his annual visit to the team, attended by Colonel R. Hale, A.D.C. His Royal Highness arrived at the Canadian camp shortly after half-past four. Here he was