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High Velocity Cartridges.

(I.—AMERICAN.)

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The black-powder rifle is passing rapidly into disuse and will, apparently, in the not very distant future, be as much out-of-date as the Brown Bess. Its place has been won by a weapon firing a charge of a smokeless nitro compound, capable of giving a much higher velocity to a projectile than black powder. The absence of smoke is, of course, an enormous advantage, but the modern compound, — I speak of all the new powders collectively, they having a strong general resemblance—boasts of others yet more valuable. For instance increased velocity gives a flatter trajectory, since gravity acts in proportion to the square of the time, and a flatter trajectory does away with the necessity for a part at least, of those calculations as to distance, so vital in the case of the earlier rifles, though much less so in the later ones. Also, the energy of a projectile being equal to its weight, into its velocity squared, divided by twice gravity, it follows that the energy—often called striking force—of the modern projectile is vastly greater than that of its predecessors.

One drawback the modern charge certainly has. The life of a barrel is much shorter than formerly, especially in the case of military weapons, of .30 caliber or less, firing a steel-mantled bullet, and in which the powder charges used may give breech pressures running up to 60,000 lbs. The resistance the air

opposes to the passage of a bullet is governed by the velocity of that bullet, and by the shape and area of its point, but not by its length, excepting to an almost infinitesimal amount. But, the greater the weight the greater the momentum at any stated velocity; and the greater the momentum the more effectually is resistance overcome. Hence, the weight of the bullet has been increased by adding length, until projectiles of four diameters have taken the place of shorter bullets wherever great range is desired.

But it was discovered that a long picket-shaped projectile, of lead, even when alloyed with a considerable percentage of tin, could not stand the increased pressure and accompanying velocity obtained through the use of nitro powders without stripping, (*i.e.*, leaving the grooves and passing down the barrel, being shaved in the process to the diameter of the interior of the barrel from land to land), thereby rendering accuracy impossible and greatly shortening range, through the absence of rotation to keep the bullet point foremost, and because of the escape of gas by way of the grooves.

To overcome this defect the projectiles were coated with a thin mantle of some harder material, such as steel, cupronickel, or alloys of a similar character. This device proved effective, and, moreover, the bullets thus protected showed