

II.

PROPELLING FORCE.

Propelling Force.—Motion as previously defined is the passing of a body, viz., a shot or shell from one place to another, i. e., from the gun to the object aimed at; but as the projectile, because of its inertia, can no more than any other inanimate body move itself. It requires a force or power to propel it from the gun to the object.

Propelling Power.—Is produced in artillery by placing at the bottom of the bore of the gun and behind the projectile a certain quantity of gunpowder and inflaming it, the powder burns and produces a great volume of gas (about 4,000 times the bulk of powder) which expanding in the bore, and finding a resistance on every side except on that of the projectile, forces it out of the gun with more or less velocity.

The force thus produced by the inflammation of the charge will be as the density of the powder used in the charge, as the heat produced by the burning of the powder and as the rapidity of its inflammation.

The estimated force produced by the explosion of gunpowder has been ascertained by experiment. It can produce a pressure of nearly 30 tons to a square inch of surface, that is to say that each square inch of the bore and base of the projectile against which this pressure was exerted, was submitted to a force equal to nearly 30 tons.

III.

RESISTING FORCES.

The propelling force is not the only one which acts on a projectile, there are others which also affect its motion, but it is by resisting or modifying it, some whilst the projectile moves inside the gun, others after the projectile has left the bore.

A. *Those forces which act on the projectile whilst in the bore, are:—*

1. The force produced by the resistance of the column of condensed air in front of the projectile in the bore of the gun; which force increases rapidly as the projectile acquires its velocity.

2. The force produced by the resistance due to friction between the projectile and the bore.—In smooth bore guns it is not considerable as the projectile simply rolls on its natural axis and rebounds along the bore. In rifled guns the artificial rotation imparted by grooves and lead coated or studded projectiles causes considerable resistance, which has been determined by experiment to be equal for a 12 pr. rifled gun to a weight varying from 3 to 20 tons.—The following conclusions may be accepted.

The resistance opposed to the motion of a projectile in the bore of a gun depends upon the form and weight of the projectile, upon the circumstance of the piece being smooth-bored or rifled, and upon the system of rifling adopted.