

*β.* Advanced works—

How works, crown works, lunettes, flèches, their objects and traces. Discuss the general objects of outworks and advanced works, and show that the accumulation of these works, formerly thought desirable, is now obsolete.

*γ.* Detached works—

Requirements, when used. (See also applied F.F.)

*δ.* Communications—

Requirements, simple, easy, safe, how carried out.

*d.* Retrenchments—

Requirements, how carried out.

*α.* Open works, cavaliers, gorge retrenchments, coupures.

*β.* Closed works, casemated keeps, interior glacis, iron plating.

*γ.* Citadels, how they differ from ordinary retrenchments, their requirements and how fulfilled.

*e.* Countermines (see mining).

**D. ARRANGEMENT OF THE ELEMENTS IN FORTRESSES.**

General considerations which govern the combination of the above elements.

*a.* *Detached Forts.*

Requirements.

*α.* Good artillery positions.

*β.* Secure against assault.

How carried out.

Where they may be suitably employed.

*b.* *Enclosed Enceintes.*

*α.* When a regular attack is not possible.

1. Long simple points.

2. Simple outworks.

3. Escarps, caponiers, and keeps completely covered from view.

*β.* When a regular attack is to be anticipated.

1. Shorter fronts, more elaborate in detail.

2. Strong salient outworks, not only to cover the communications across the ditch, but to provide large and safe places of assembly for troops outside the ditch, and to bring flank and reverse fire, on an enemy attempting to advance to the salients of the enceinte. Counter mines under glacis.

3. Escarps, caponiers and keeps, completely covered, not only from view, but also from distant curved artillery fire—hence masks, iron plating, interior glacis, the latter countermined.

*c.* *Combination of Enclosed Enceintes and Detached Forts*—To form first class modern fortresses.

*α.* The enceinte as in (D — *b* — *β*) above.

*β.* The detached forts.

1. The individual forts as in (D — *a*) above.

2. Considerations which have brought into prominence in modern fortification, the combination of detached forts with enclosed enceintes.

**E. SKETCH OF PROGRESS OF PERMANENT FORTIFICATION with examples of best modern works in detail.**

*a.* *Permanent Fortification before the Introduction of Gunpowder*, methods of attack to which it was exposed, and means taken to resist them.

Show that the principles were the same as in modern fortification.

*b.* *The Transition Period.*

Effects of the introduction of cannon, and of mining with gunpowder.

*α.* On the site.