AN ELEMENTARY COURSE OF MILITARY ENGINEERING. PART II. PERMANENT FORTIFICATIONS

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An Elementary Course of Military Engineering. Part II. Permanent Fortifications by D. H. Mahan

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OF

MILITARY ENGINEERING.

PART II.

PERMANENT FORTIFICATIONS.

BY

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PREFACE.

THE contents of this volume were not intended for publication in their present form; having been arranged specially with regard to the limited time allowed, for instruction in this branch of their studies, to the Cadets of the United States Military Academy.

In this arrangement, the chief object had in view has been to enable the pupil to examine intelligently the productions of others, and to present his own ideas understandingly. To effect this, the attempt has been made to give, in as concise a form as practicable, the general principles of Permanent Fortification, and their applications, as presented in the writings and practice of military engineers whose works are accepted as professional standards.

Particular prominence has been given to Noizet's Method as an instructive elementary exercise; both as to the manner of combining the elements of a bastioned front, and of delineating with accuracy its various details.

ELEMENTS

OF

PERMANENT FORTIFICATION.

CHAPTER I.

PRELIMINARY CONSIDERATIONS AND COMPONENT ELEMENTS OF PERMANENT DEFENCES.

SUMMARY.

Permanent fortification, its objects and means of attainment (Art. 1).—Description and analysis of the usual general profile (Art. 5).—Description of recent modified profile (Art. 8).—Command (Art. 9).—Description and discussion of scarps (Art. 10).—Counterscarps (Art. 11).—Ditch (Art. 12).—Face covers (Art. 13).—General remarks on the general profile (Art. 14).—Classes of open defences (Art. 15).—Loop-holed walls (Art. 16).—Exterior corridors (Art. 17).—Barbette batteries (Art. 18).—Embrasure batteries (Art. 19).—Machicouli defences (Art. 20).—Detached scarp walls (Art. 21).—Semi-detached scarp walls (Art. 22).—Scarp galleries (Art. 23).—Counterscarp galleries (Art. 24).—Bastionnets (Art. 25).—Caponnière defences for enceinte ditch (Art. 26).—General Remarks (Art. 27).—Casemates on land fronts (Art. 28).—Mortar casemates (Art. 29).—Casemates for water fronts (Art. 30).—Embrasures of casemates (Art. 31).—Bomb-proof buildings (Art. 32).—Powder magazines (Art. 33).—General remarks on communications (Art. 34).—Particular conditions that communications should satisfy (Art. 35).—Ramps (Art. 36).—Scairs (Art. 37).—Posterns (Art. 38).—Gateway (Art. 39).—Port-Cullis (Art. 40).—Classes of enceintes (Art. 41).—Systems and methods of fortification (Art. 42).—General remarks (Art. 43).—General remarks on outworks (Art. 44).—General conditions outworks should satisfy (Art. 45).—Classes of outworks (Art. 46).—Covered-way (Art. 47).—Places of arms (Art. 48).—Traverses (Art. 49).—Tenaille (Art. 50).—Demi-lune (Art. 51).—Counterguard (Art. 52).—Redoubts (Art. 53).—Tenaillon (Art. 54).—Horn-work (Art. 55).—Crown-work (Art. 56).—Advanced and detached works (Art. 57).—Interior retrenchments and cavaliers (Art. 60).

I.

PRELIMINARY CONSIDERATIONS.

1. The term *permanent fortification* is applied to those defences which, constructed of materials of a durable nature, and designed for permanent occupancy by troops, receive such a degree of strength that an enemy will be forced to

the operations either of a siege or a blockade, to gain possession of them.

2. These defences differ from temporary fortification but in degree; the general principles of defensive works being alike applicable to both.

3. The object of such defences is to secure the permanent military possession of those points, either on the frontiers, or in the interior of a state, which must, at all times, have a well defined bearing on the operations of a defensive or an offensive war.

4. For the attainment of this object, the following general conditions should be fulfilled in the arrangement of such defences:

1st. *They should be of sufficient strength to resist with success all the ordinary means resorted to by an assailant in an open assault.*

2d. *Be provided with suitable shelters to protect the troops, the armament, and the magazines of provisions and munitions of war required for their defence against the destructive measures of the assailant of every description.*

3d. *Be so planned that every point exterior to the defences within cannon range shall be thoroughly swept by their fire.*

4th. *Have secure and easy means of communication for the movements of the troops, both within the defences and to the exterior.*

5th. *And, finally, be provided with all such accessory defensive means as the natural features of the position itself may afford, to enable the garrison to dispute with energy the occupancy by the assailant of every point both within and exterior to the defences.*

The defensive branch of the military engineer's art consists in a knowledge of the means which are employed to fulfil the above conditions, and of their suitable adaptation to the natural features of the positions he may be called upon to fortify.

II.

COMPONENT ELEMENTS OF PERMANENT WORKS.

GENERAL PROFILE.

5. The first condition laid down for permanent defences, security from open assault, supposes a strength of profile

greatly superior to that which is given to temporary works.

6. The usual and most simple form of profile for permanent works consists of a *rampart;* a *parapet;* and a *ditch*, the *scarp* and *counterscarp* of which are faced with *steep walls* of *stone* or *brick*, and exterior to which a *glacis* is usually thrown up.

When the ditch contains at all times a depth of water sufficient to prevent its being forded, the scarp and counterscarp may be simply slopes of earth like those of field works; as the water, with ordinary vigilance on the part of the defence, will give security from surprise, and all the other ordinary means of an open assault.

The Rampart, A, Pl. 3, Figs. 4, 6, is an earthen mound, raised above the natural level of the ground, and upon which the parapet B is placed.

The rampart thus serves to give the troops and armament, which are placed on top of it and behind the parapet, a commanding view over the ground to be guarded by the fire of the defences; whilst, at the same time, it increases the obstacle to an open assault, by the additional height it gives to the scarp.

The top surface of the rampart, b c, in rear of the parapet, termed the *terre-plein*, affords the troops and armament a convenient position for circulation from point to point, where they are sheltered from the direct views of the assailants' fire.

The rampart is usually terminated on the interior, a b, by allowing the earth to assume either its natural slope, or one somewhat less steep, and which is termed the *rampart-slope.*

In cases where this slope would take up too much of the ground within the defences it is replaced by a wall, termed the *parade-wall*, which rises from the level of the interior ground, termed the *parade*, to the interior line of the *terre-plein.*

Inclined planes of earth, termed *ramps*, lead from the parade to the terre-plein, being placed against the rampart-slope, or the parade-wall. The ramps are, in some cases, terminated, inwardly, with the same slope as that of the rampart; in others, this slope is replaced by a wall, which rises to the top surface of the ramp, or a little above it.

7. **The Parapet,** serving the same purposes in permanent as in field works, receives the same general form as in the latter.