

TRANSACTIONS

OF THE

Literary and Historical Society of Quebec.

SESSION OF 1873-74.

PAPER I.—SIEGES, AND THE CHANGES PRODUCED BY MODERN WEAPONS.

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(Read before the Society, March 18th, 1874.)

IN the last paper I had the honor of reading before this Society, I endeavoured to give an artillery retrospect of the last great war; but an evening-hour I found too short to give you more than a tactical artillery sketch and some technical details as to the quality of the guns used. I propose, this evening, to resume that part of the subject which treats of modern sieges, commencing with a cursory glance at ancient sieges, in which you will excuse me if I descend to elementary principles, with which a majority of you are, doubtless, familiar, but to which it is necessary to draw the attention of some of my non-military audience, to enable them to get a clear insight into the changes produced by modern weapons.

The subject naturally divides itself into

INVESTMENTS,
BOMBARDMENTS, and
REGULAR SIEGES.

If your patience will permit, I will conclude with a few remarks on the famous fortress in which we live, the

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Gibraltar of this continent, its present armament—or, if I speak truth, its present disarmament—and the part it might yet be called upon to play as the gate of British North America,—the last spot on which the old flag we love once floated, when it had been swept from this continent by our foes in 1775, and waved alone on Cape Diamond; from thence it has been carried, by the indomitable courage of our race, from the Atlantic to the Pacific slopes. It may be trite, but none the less true, that history repeats itself.

The primary object of fortification was to enable the few to hold their own against the many,—the weak against the strong; to prevent surprise, and gain time for organized defence. Before the days of artillery, massive continuous walls protected unwarlike citizens from the sudden incursions of fiercer foes. The great wall of China against the Tartars, and that of Agricola to keep out the Picts and Scots, the walls of Babylon and others, were of this character. The besiegers raised a large mound of earth to command the walls, and surrounded the city with lines of circumvallation to confine the garrison.

The battering-ram was the chief agent in breaching ancient walls. A huge beam, sometimes 100 feet long, with a metal head, was horizontally suspended by ropes, generally under a shed, to protect the assailants, and made to oscillate by manual power, striking the wall until it crumbled to ruin. Josephus says that no walls were able to resist this weapon. The upper story of the shed or moveable tower (the beffroi of the middle ages) was occupied by archers, who could command the walls of the besieged. In all battering or breaching, the weight of *missile* or striking object and velocity of impact are the two factors producing the result.

The theory and practice of gunnery prove that the weight multiplied by the square of the velocity on impact,

divided by force of gravity, equals the work stored up in the *missile*, $\frac{wV^2}{2G}$, if you will forgive the use of formulæ.

In the battering-ram, the force of gravity was in suspension; the weight was enormous, the velocity being low, compared to the 1,300 feet per second of a projectile from a rifled gun. The vibration produced by the quick succession of blows on the same spot produced the results which, in modern days, are effected by breaching-batteries at long range.

The first step in defence against battering-rams was a ditch, which prevented the engine being brought near enough to the walls; and the counter-step of attack was to descend into the ditch by excavating a covered gallery, mining under the walls, and supporting them by beams of timber, which, when set fire to by the besiegers, crumbled away and caused the fall of the unsupported wall.

The defence against this species of attack led to the Matchicouli gallery, or projection of the upper part of the walls, giving that picturesqueness to military ruins which, however, those made by the Corporation of Quebec do not at present possess. There were spaces in the floor of the projecting Matchicouli which enabled the besiegers to pour melted lead, boiling water, stones, and arrows, on the assailants at the foot of the wall.

Flank defence was obtained by the projecting towers, in which may be found the germ of Vauban's bastioned trace (plate 1, fig. 1). The larger bastion for artillery, and the flank at right angles to the face of the bastion, enabling it to be seen to its salient, might, perhaps, in these days, be designated as a Darwinian development (fig. 2).

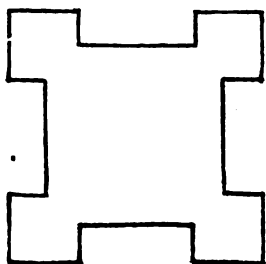
In addition to the battering-ram and the undermining of walls, various engines were used, throwing huge stones and other projectiles, and sometimes the carcass of an

unhappy captive, who was thus set free from his sorrows and sent back to his friends. The Balista Catapulta (see fig. 3) are of the time of Julius Cæsar.

The huge unwieldy cannon cast on the spot by Sultan Muhamed II. for the siege of Constantinople, in 1451, were, from their cost and immobility, seldom imitated (fig. 4, plate 1). Some of them remain at the Straits of the Dardanelles to this day, monuments of the skill and energy of a Mahomedan people, once the terror of Europe, who still linger on its confines.

Passing by the feudal castles and those of the predatory chieftains of the middle ages, which occupy more of a personal than national place in military history, being, for the most part (for rapine and security from its consequences), built on isolated hills, they were seldom found in the fertile valleys that cause the confluence of rivers and the natural roads of traffic. Such valleys were the natural sites of free fortified cities, whose sturdy burghers were not, as yet, too effeminate to defend their commerce. Soon, however, with the consolidated power of kings, artillery, and standing armies, these cities became regular fortresses for defence of frontiers, as well as magazines and *dépôts* of stores, serving also as bases of supply when invading a neighbouring territory. The walls so easily destroyed by artillery had to be sunk and covered with earth; and these walled ditches were given a trace, so that every part could be seen and flanked by some other part. This led to the outline of Vauban's system, with its projecting salients; and the great engineer was the first artillerist to find a means of attacking his own and kindred systems, no longer at the mercy of direct fire,—so true is the dictum, "*Pour être ingénieur on doit surtout être artilleur.*" At the siege of Ath, in 1697, Vauban introduced enfilade ricochet fire, which system gave the advantage to attack over defence. By erecting batteries on the prolongations of the long faces of his salients, using a

FIG. 1



FLANK DEFENCE

FIG. 2

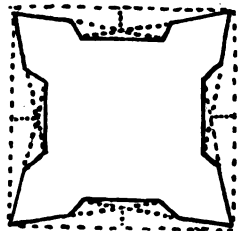
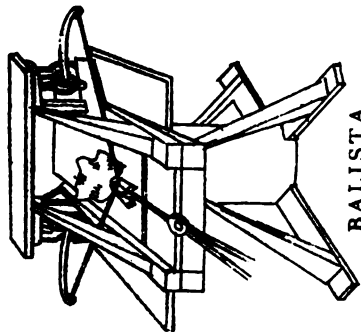


FIG. 3



BALISTA

FIG. 4

TURKISH GUN



"HELP O GOD" THE SULTAN MUHAMMED KHAN SON OF MURAD

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reduced charge and high elevation, the shot were made to bound along the line of the enemy's works, destroying material and men. When the guns on these long faces were dismounted or silenced, he made his zig-zag approaches, directed outside the neighboring salients, on the capitals of those he was attacking ; so that these *boyaux* could not be seen into or enfiladed, as the long lines of the fortresses had previously been. Gradually, as the trenches reached the escarp or wall of the ditch, breaching-batteries were established there.

A breach and lodgment was effected, and each captured out-work became, in its turn, a *point d'appui* for the attack of the next ; so the fall of the place, under ordinary circumstances, became a question of time, unless in such naturally strong positions that the prolongation of the faces fell on marshes or rocky soil unsuitable for the excavation of trenches or batteries.

In the days of *Le Grand Monarque* sieges were so prolonged, and the reduction of a fortress considered of such consequence as to become the object of and occupy the energies of a whole campaign. The rapid fall of French fortresses has made us forget that Sevastopol was the sole trophy of united French and English effort during the Crimean campaign, and that the quadrilateral of northern Italy stayed the tide of conquest of Napoleon III. and Victor Emmanuel. Before these days, however, the military genius of Prussia, under Frederick the Great, and France, under Napoleon I., had learned to mask fortresses and decide the fate of empires in the field.

There are some who argue, from the rapid downfall of French fortresses, that all fortifications are useless ; that the cruel effects of bombardment, complete investments, and famine, have relegated sieges to the history of the past ; and that fortification is a useless provocative of human suffering. I wish, with all my heart, that I could

think it were so. But there are circumstances where no amount of disarmament and self-abasement will purchase for a people immunity from suffering, even though they hold lightly their own manhood and the surrender of the birthright of their children, purchased with the blood of their forefathers. They must endure, in pocket and person, the rapacity of their invaders, and contribute to the support of war for their own conquest; whereas a little foresight, a little self-denial in peace, will produce that preparedness for war which is the palladium of national security.

It is not safe to jump at conclusions without due consideration of the causes that have produced certain results.

The practical answer of the Germans, after their experience, is to strengthen the most important strongholds they have wrested from the French, building detached forts, which keep an enemy at a distance.* Let us hear a French opinion, even in the bitterness of defeat :

“ La résistance souvent courte et inefficace de nos places, dans la guerre que nous venons de soutenir contre les Allemands, a dû nécessairement frapper l’opinion publique, et il est à craindre que l’on ne soit tenté d’en conclure à l’impuissance de la fortification. Cependant la cause de ces faits se trouve bien plutôt dans le manque des éléments

* NOTE.—There are at this moment 10,000 workmen employed on the forts at Strasbourg and a large number at Metz. The smaller fortresses in places of no strategic importance are to be dismantled. A useless number of fortresses absorbs an army of defenders, who must surrender if the more important places fall. Sedan was a mere trap for the French army, from its situation in a basin (plate 4, figure 10), its useless armament of smooth-bore guns, and the political madness which necessitated a line of operations inevitably ending in a battle, with the line of retreat cut off by neutral territory.

TABLE No. 1.—German Attack on the Southern Forts of Paris.

POSITION OF BATTERY.	Number of Battery	No. of Pcs.	NATURE.	Range, Metres.	Relative Level of Battery and Object, in Metres.	No. of Rounds said to have been Fired.	OBJECTS.
Behind Pavillon de Breteuil, in Park of St. Cloud.	I.	6	{ At first 24-Prs; afterwards 12-Prs. }	3:60	+ 72	1250—2570	{ Point du Jour and Billancourt, Boulogne and the Seine.
Left Flank of Terrace of Meudon.	II.	8	{ 4 12-Prs.—4 24-Prs. }	3520	+ 80	1310—1460	{ Point du Jour and the North Branch of the Seine.
Terrace of Meudon.	III.	6	2 12-Prs.—4 24-Prs.	2950	+ 80	{ 1310 from 12-Prs. 1890 " 24 "	{ Fort Issy.
Do.	IV.	6	Do. { 2 12 Pcs. } do. { 2 6-Pcs. } { 2 21-Pcs. }	2950	+ 80	>About the same.	{ Ditto.
Southern part of Wood of Meudon.	V.	6	{ 2 6-Pcs. } { 2 21-Pcs. } { 24-Prs. }	2500	about + 60	{ 2260 from 12-Prs. 24 " " 6 " " 610 " " 6 " "	{ Ditto.
South-east of No. V., at Southern edge of Wood	VI.	6	24-Prs.	2900—3000	+ 73	1060	{ Vaives.
Left Battery on Heights of Chailillon.	VII.	6	2 12-Prs.—4 24-Prs.	2200	+ 60	{ 450 from 12-Prs. 2900 " " 24 " "	{ Issy.
Plateau of Chailillon, to right front of VII.	VIII.	6	21-Prs.	1790	+ 75	3260	{ Vaives.
Right flank of VII., on Chevreuse road	IX.	8	12-Prs.	1540—3220	+ 75	4000	{ Fort enflaming Vaives and Montrouge.
To East of IX., and S. of Chevreuse road	X.	6	21-Prs.	2900	+ 60	1000	{ Probably Montrouge.
Due South of the Village of Chailillon, a little north-east of Fontenay-aux-Roses, (one on each side of the road)	XI.	6	12-Prs.	2900	+ 16	1940	{ Probably Montrouge.
Plateau of Chailillon, west of No. VII.	XII.	6	24-Prs.	3000	+ 30	3760	{ Issy and Vaives.
Ditto, west of No. IX.	XIII.	2	{ 8, 26-in. Rifled Mortars; elevation up to 90 degs. }	{ 2040 round 2080 }	+ 60 and 70	800 (about),	
West of Bagneux	XIV.	2	Ditto.	1850 and 2180	Ditto.	800 (about),	
Terrace of Meudon, between II. and III.	XV.	2	Ditto.	2240	+ 4	800 (about),	
Plateau of Chailillon, to left front of VIII.	XVI.	4	12-Prs.	2400	+ 80	1790	{ Montrouge.
S. of Road from Bagneux to Chailillon	XVII.	6	Bronze 24-Prs.	1300—2200	+ 75	2430	{ Ground in front of Fort Issy.
The Swiss Cadelet, N. of Wood of Meudon	XVIII.	6	{ 6 short 24-Prs. } { 2 to 4 long 24-Prs. }	2300—3600	+ 18	2800	{ French Earthworks between Issy and Vaives.
Wood of Meudon, by Porte de Clamart	XIX.	6		1600—3400	+ 30	{ 2000 } { 1100 }	{ Breaching curtain S. front of Issy; also against Paris.
To West of Village of Chailillon	XX.	6	Long 24-Prs.	2500—2600	+ 45	2050	{ S. front of Vaives and left face of N.-W. bastion.
Close to left of No. XVIII.	XXI.	8	Short 24-Prs.	1330	+ 22	1890	{ Montrouge and Paris.
Right rear of the Moulin en Pierre	XXII.	6	60-Pr. Mortars.	2303—3600	+ 18	1700	{ Fort of Issy and advanced Works.
	XXIII.	4		1100	+ 30	250	

“ nécessaires pour utiliser convenablement nos forteresses
 “ que dans la nature même de leur rôle et des services
 “ qu’elles peuvent rendre. Pour qu’une place paralyse un
 “ grand nombre d’ennemis et résiste longtemps, il lui faut,
 “ en plus de ses remparts, des approvisionnements et une
 “ garnison suffisante. Il faut, en un mot, qu’on veuille,
 “ qu’on sache et qu’on puisse la défendre.”

The most notable captures of fortified towns were those of Paris, Strasbourg, Belfort, Metz, Thionville, Toul, New Breisach, Schelestadt, and Sedan.

There were two sieges of Paris : the first, by the Germans, was a complete and enormously extended investment, producing scarcity of provisions, combined with bombardment of the town, and a not very successful effort at breaching from a distance a few of the detached forts. Fort Issy, on the south side, was made the focus of gun-fire attack, 46 pieces converging upon it from the terrace and woods of Meudon, the plateau of Chatillon, and the *moulin-en-pierre* batteries.

TABLE I. of the German attack on the southern forts of Paris gives the position of the batteries ; shews the number and nature of the guns, range, relative level of batteries, the amount of ammunition expended, and the object of fire. The guns and mortars were all rifled except four 50-pounder mortars. There were in the siege-train also four rifled 21-centimètre mortars, throwing a projectile of 180 lbs. ; but no *guns* heavier than our 64-pounders were mounted.

It must be borne in mind that the Prussian B. L. rifled 4-pounder throws a shell 10 lbs.

6	“	“	“	15	“
12	“	“	“	30	“
24	“	“	“	60	“

There were no regular parallels or approaches of attack. Circumstances of ground generally decided the position of each battery, rather than the old rules for placing batteries especially to enfilade, counter-batter, or breach.

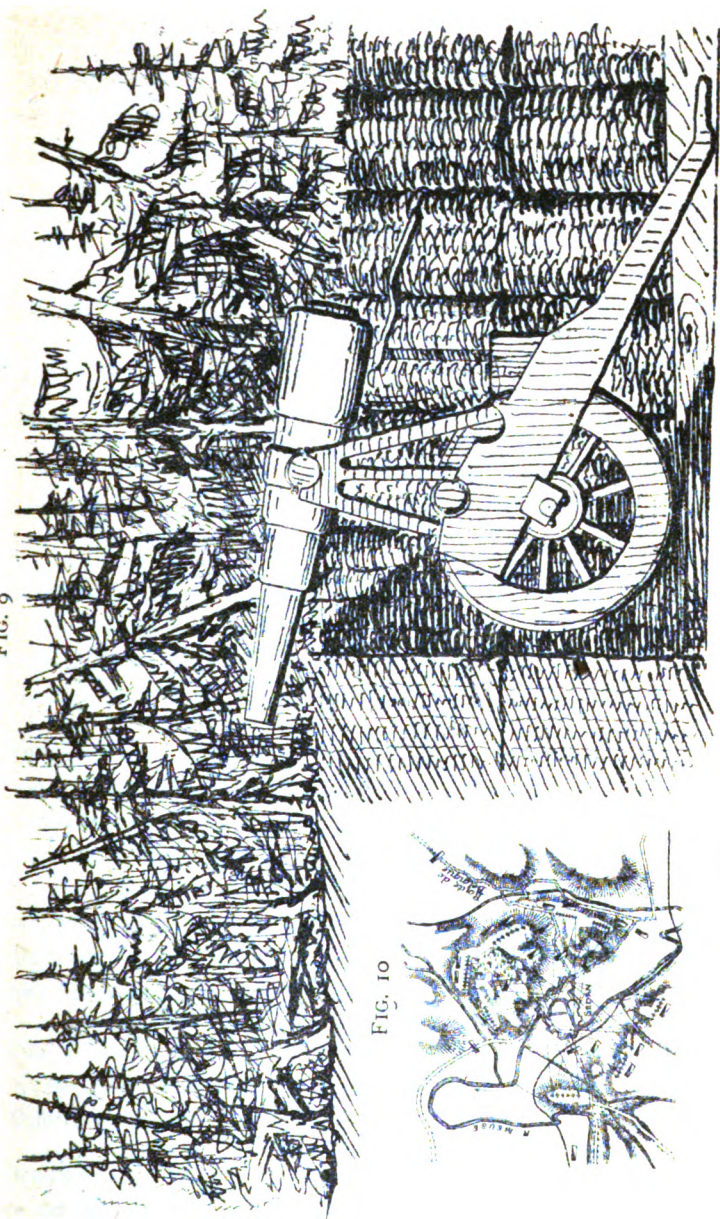
Indeed, the *first* point of difference between the late sieges and those of former wars was, that the regular approach, until breaching-batteries were erected on the escarp, was no longer necessary, from the greater accuracy, range, and shell-power of rifled guns, the curved trajectory of which, just clearing the crest of the glacis, could at long range effect a breach (plate 3, figures 6 and 8); while the large arc, of two thousand yards radius, or thereabouts, offered a great choice of position.

The Germans generally chose the reverse slope of high ground, so that a slight excavation in rear left the natural surface of the ground for the body of the parapet more solid than any elevated construction (plate 4, fig. 9). Traverses were not dug out to be again filled in, but emplacements for guns cut out of the reverse slope of the hill; the intervening space left as a traverse, sometimes excavated to contain an expense magazine.

Whenever available, the batteries were built a little distance within woods and orchards, which concealed their construction and armament. At the desired moment the trees in the line of fire were half-cut through; the first discharge blew them down, and such as did not impede fire were left on the ground as *abbatis*, their pointed branches towards the front forming an obstacle to *coup-de-main* (plate 4, figure 9).

When necessarily in the open, a sham-battery or screen, when no natural one was available, was thrown up in front of the real battery, at 50 or 60 yards from it, to deceive the

FIG. 9



GUN EMPLACEMENT IN FOREST

FIG. 10



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enemy and attract some portion of his fire. I was told by *soi-disant* eye-witnesses that snow-screens were even on some occasions used, and blank cartridges exploded in their sham embrasures; certainly, piles of firewood, and even brush-wood that happened to be on the spot, had been utilized as screens.

It must not be supposed that the Prussians had a monopoly of military intelligence. In some schools of instruction for the British army, the laying aside of the old system of attack and its stereotyped rules had been anticipated and put into instructional practice long before the first note of war; and Prussian officers have been pretty frequent visitors at our gunnery experiments and Shoeburyness School of Instruction.

Perhaps the *second lesson* of detail to be learnt is the fact that embrasures are funnels directing the enemy's fire into the battery, an evil which increases with the thickness of parapet, due to rifled-gun penetration.

The Prussian siege-guns had an iron bracket bolted on to the ordinary travelling-carriage (plate 4, fig. 9), which raised the trunnions at least six feet above the ground. No man of the detachment is ever under direct fire, except the slight exposure of No. 1 in laying, who, of course, in order to see, must be seen; and, with breech-loading guns firing at high angles, as they would be at long ranges, the breech comes conveniently down for loading.

The French occasionally, in their fortresses, made use of a barbette carriage more unwieldy, without gaining sufficient cover, and not suitable for travelling.

Occasionally the Prussian guns were fired by pointing rods on the parapet, on the same principle as mortars: the wheels were on two long inclined planes (1 in 6), with flanges on the inside; while the trail rested on planks on

the ground-level, which gives increased elevation, the platform resembling that of Colonel Clark, R.A. The guns recoiling, the wheels run up the ascent, and then quietly run down to their former convenient position for breech-loading (plate 4, fig. 9).

As before stated, there were no regular parallels of communication between the batteries; but the accidental cover given by houses, sheds, garden-walls, &c., was always utilized as a covered-way. In the open, when absolutely exposed, narrow trenches, about five feet deep and two feet wide, were run along, affording cover for single file. On the other hand, the batteries were almost always constructed near railroads or on the numerous good high-roads leading to Paris from the rear, affording facilities for armament and the bringing up of projectiles. Thus, construction of batteries on the great highways of the country may be considered as the *third* characteristic of modern attack, rendered doubly necessary to the Germans on account of their great distance from the primary bases of operation in their own country. Possibly the rival importance of munitions *de guerre* and munitions *de bouche*—the fact that every projectile brought to the front meant so much less sausage, so much less bread—was one reason why the process of complete investment and partial bombardment was preferred to vigorous, breaching attack, the Prussians judging that the hearts and stomachs of the Parisians were more vulnerable than their fortifications.

Indeed, the most formidable breach made by the Prussians, which was at fort "Issy," was scarcely practicable, as an assault could not have passed over the parapet by it; and though two adjacent casemates were cut into by curved fire with reduced charges, long shells, and percussion fuses, yet the defenders appear immediately to have barricaded the breach with sand-bags, backed with earth

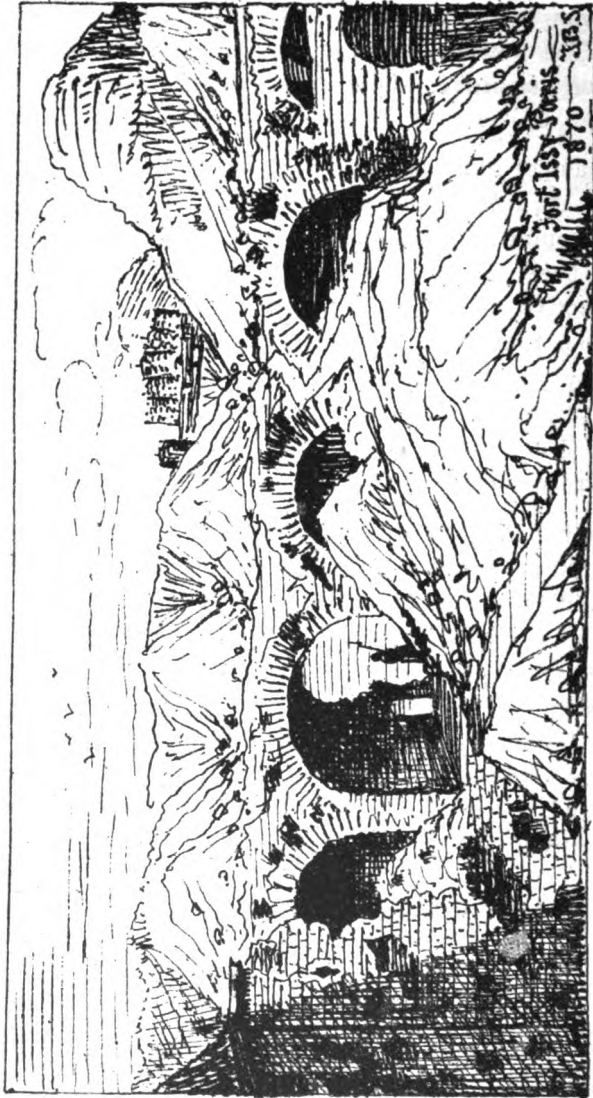


FIG. 11

and stones,—a difficult task, if we remember that the ground was frozen during the abnormal severity of that winter. The powder-magazine of the nearest battery to fort Issy, *moulin-en-pierre*, about one thousand metres distant, was blown up.

The heaviest guns used in the defence at “Issy” were 6½-inch M. L. rifled; and, considering the enormous amount of fire concentrated upon it, the breach seems, in my opinion, to have been not a surprising artillery success. A far more effective breach was made at the same spot (fort Issy) by the French artillery of the Versailles army, at the second siege, with less effective weapons, after the Prussians had gained possession of the best French ordnance (plate 5, fig. 11). The French also suffered from using embrasures more than the German gunners in the same batteries.

The French artillery deserve infinite credit for the manner in which they utilized a quantity of old bronze smooth-bore guns by rifling and making projectiles. In some instances I found old-fashioned guns with the date and arms of Louis Quatorze, which had been so rifled, and done duty in the second siege. The sketch of the breach at fort “Issy” is enlarged from a drawing I made on the spot immediately after the second siege: it is, of course, quite an indefensible breach, and a remarkable instance of the terrific power of modern artillery (plate 5, fig. 11).

The French officer, who looked over my shoulder, said, with a sad smile: “And you, too, our comrades of the “Crimea, have come over to sneer and find fault.” “*Væ victis!*” is an old story with the world in general; but British officers, as a rule, seek to learn their profession by a dispassionate search for truth.

Whatever may be said of the *Garde Mobile* and *Moblots* of sorts who so feebly defended the French fortresses, and yet broke into fierce political strife while their country was under

the foot of the invader, does not apply to the marine, nor to the regular French artillery, a mere handful of whom defended the French fortresses; and this deficiency of regular artillerymen was one great cause of disaster. Garrison artillery is not a showy service, and was, therefore, somewhat neglected in France for the more dashing service of the mounted batteries. I was much struck with this deficiency before the war. The few regular artillery found in French fortresses did their duty to the utmost, and the officers of that branch were gallant gentlemen, of high scientific attainments, from the *Ecole Polytechnique*.

I was told a somewhat characteristic story of a young French lieutenant of artillery, conspicuous for his devotion in the batteries of Paris, who, nevertheless, managed to spend in musical recreation most of the few short hours left for rest. As provisions got scarcer, his meat-ration was reduced to a sparrow per diem; these he kept in a cage at the window near his piano, and fed with the crumbs of his daily biscuit. His landlady anxiously watched him growing thinner and paler, and entreated, in vain, to be allowed to transform his little pets into a delicious *pâté d'alouettes*. At length his bullet found its destined billet: a Prussian shell struck the cage at the window, and death liberated the young lieutenant and his pets as he sat at his piano singing his own last requiem. I was assured of the truth of the story. "*Si non e vero, ben trovato.*"

It is typical of the fact that the coarser qualities called forth by war, the sights of suffering and the sense of personal danger, do not necessarily alter a refined nature, which often combines the tenderness of a woman with the highest courage of a man. It is not altogether strange that it should be so, when we remember that the utmost tenderness, the highest personal courage and endurance, were characteristic of the one perfect Man whom we

TABLE No. 2.---Bombardment of the Northern Defences of Paris, 1870-71.

POSITION OF BATTERY.	Number of Battery.	No. of Pcs.	Range, Mètres.	Command of Battery over Object, in Mètres.	OBJECTS.
Et Road to Gorges, N. W. of Stains.....	XXII.	14	3200	+	E. Face Double Couronne.
N. of Stains.....	XXIII.		3250	+	Ditto.
Ditto.....	XXIV.		2940	+	Ditto.
Ditto.....	XXV.		070	+	Ditto.
E. of Pierrefite, near Railway.....	XXVI.	3	1962	+	N. Face of Ditto.
Heights of Faucelle, E. Slope.....	XXVII.	6	2360	+	Ditto.
Ditto, in rear of Quarry, W. Slope.....	XXVIII.	8 to 10	2460	+	Ditto.
On the Pavillon Rouge, before Montmorency.....	XXIX.	10	4600	+	Fort La Briche.
Ditto, ditto.....	3 others.	18	4500	do.	Ditto.
Before Deuil.....	1 other.	3	3400	+	Against Epinay.
South of Railway, near LaBarre.....	others.	18	3700	+	Ag't N. W. Face Dble. Couronne, or perhaps La Briche.
Before Enghien.....	XXXI.	6	3070	do.	La Briche.
Before Ormessen, at level crossing.....	XXXII.	6	3000	do.	Ditto.
Before St. Gratien.....	One.	6	2800	+	Ditto.
Near Epinay, by roadside.....	One.	6	4400	+	Ditto.
At the Basse Pison.....	One.	5	2500	+	Double Couronne.
Between Pierrefite and Stains.....	2 or 3.	24	4270	+	Ditto.
Before Stains.....	Several.	24		+	Ditto.
	1 or 2	6		+	Slight.

have been for 1800 years more or less feebly trying to imitate, and He took His human nature from his mother only.

To turn to the German bombardment of the north forts of Paris, by about 80 siege and 30 field-guns, which were chiefly directed from three points (see TABLE II.) on the "double Couronne," at ranges from 2,000 to 4,000 metres. Fort La Briche was also attacked by some 60 pieces. The double Couronne did not suffer much; but part of the town of St. Dennis, in rear, was ruined. Mount Valérien, on the west, seemed quite intact; and, indeed, its command was such that very few shells are said to have reached the plateau.

The most interesting feature of the German artillery attack on the east was the plateau of Averon, which had been occupied with French outworks. I was much struck with the German sunken batteries, masked by trees, and enfilading the French salient from the reverse slopes of the opposite hills, in close proximity to the line of rail from Strasbourg bringing up armament and munitions.

The Prussian commandant of artillery (to whom I had a letter of introduction, through the kindness of Colonel Roerdentz, of the Prussian artillery) informed me that those batteries had been armed under cover of the trees, and regulated their fire to a great extent by signals from an officer, who, with a sergeant and a couple of men, ensconced himself in an abandoned French villa in line with their works, keeping the Venetian blinds closed towards the French, and signalling to his comrades from the back windows. Their fire necessarily became most accurate, as they were also guided by very complete plans of the place on which the lines of fire were drawn and the ranges measured. The same distinguished artillery-officer, General

Von Decker, who directed the attack at Strasbourg, most courteously shewed me the plans he had used.

He seemed to attach the greatest importance to such a use of plans for the direction of artillery-fire. I only wish I had found some Departments, with which I have closer relations, as facile on the subject of plans as the commandant of Prussian artillery.

With these few remarks on what I think important points, I must close this outline-sketch of German artillery-attack on Paris. Time and space do not admit of my describing the lines of investment, 50 miles in circumference, or the various sorties and the great battles around Paris in her efforts to break the fiery circle of her foes.

SECOND SIEGE OF PARIS.

The most important batteries are given in TABLE III.; but, in addition, the old German batteries at "Meudon," "Clamert," and "Chatillon," were rearmed by the French with the smooth-bore bronze converted rifled guns before mentioned, embrasures being, of necessity, cut for the low French carriages and rope mantlets, resembling those used in the Crimea, affording but partial protection to the gunners.

The gaps cut in the *enceinte* for exit by the main roads, during peace, formed the chief points of attack; and the temporary barricades were almost swept away by artillery-fire. The Porte d'Auteuil and the houses around Point-du-Jour suffered very much, and give some idea of the destruction produced by modern artillery; yet, from all I could gather, the actual loss of life among the non-combatants was exceedingly small: they remained tolerably secure, if not comfortable, in the cellars of their houses.

Woods, composed of trees large enough to explode a percussion-fuse on impact, afford almost complete immunity

TABLE No. 3.—Second Siege of Paris, 1871.

POSITION OF BATTERY.	No. of Pes.	NATURE.	Range, Metres.	No. of Rounds Fired.	Relative Level of Battery and Object, in Metres.	OBJECTS.
Terrace of Valérien.....	16	B. L., Naval.	6160	.....	+ 120	Porte Maillot.
Batteries (seven) at Montreuil.....	76	Ditto.	3145	40 r. units per gun per day.	+ 60	Porte d'Autueil and Porte St. Cloud.
Ditto at Bellevue.....	8 to 10	{ M. L. Brown Rifle } about 50-Prs.	2850	.....	+ 64	Porte St. Cloud and Point du Jour; also the Seine.
Batteries in N. Front of Icy to E. of Gate	3	Ditto	2140	1600	+ 52	To form breach at Point du Jour and enceinte near Grenelle
Ditto ditto to W. of Gate.	5	Ditto.	2140	.....	+ 52	To counter-batter enceinte and keep down fire of defence.
Batteries in Bois de Boulogne, most of them in rear of the "Lignes".....	62	{ Chiefly Bronze R M L. } about 50-p. rifles and about 10 Mitrailleurs.	800 } about	.....	.....
Part of St. Cloud, at La Lanterne.....	not shown.	{ }	About 3100	{ }	+ 56	On enceinte towards Point du Jour and Boulogne.
Ditto, at Breteuil.....					+ 72	
Ditto, at Porte du Mail.....					+ 4	

from fire at such a distance back in the wood as that the view towards the enemy is obstructed by the trunks of trees. In the Bois de Boulogne lived an elderly lady, who had not, she assured me, left her cottage during the whole siege. The trees between the house and the *enceinte* were very much torn and cut about by projectiles; but only one splinter of shell had struck a corner of the house, and done but little damage.

A very rough species of narrow, shallow, double-flying sap, it might be called, which gave many lines of musketry fire, and looked like the trace of a dislocated gridiron, had been pushed from the Bois de Boulogne close to the *enceinte*, after the parapets were comparatively cleared of defenders by curved shrapnel-fire and musketry.

SIEGE OF STRASBOURG.

This siege was, perhaps, the most regular of any during the war (plate 2, fig. 5). The bombardment of the town, which began on the 24th of August, having failed to produce surrender, the first parallel was traced at about 800 yards from the *enceinte*, and completed by the 28th. Batteries for 46 guns were finished by the end of the month; the second parallel was finished at the end of the first week in September, and the third parallel begun on the 12th. The close attack was almost entirely carried on by flying sap. Wall-pieces, with picked marksmen and light field-guns, were pushed forward in the trenches, and very much facilitated the approaches. About 240 siege-guns were placed in position. TABLE IV. gives details shewing a total of 193,000 rounds fired in a month—an average of 6,000 rounds per diem.

Two practicable breaches were made: that on the right face of Lunette No. 53 took four days and about 1,000

rounds; that on the right face of bastion No. 11, only eighteen hours and 600 rounds (plate 2, figure 5).

These results were produced by curved fire from rifled guns, of which I will endeavour here to give a brief description.

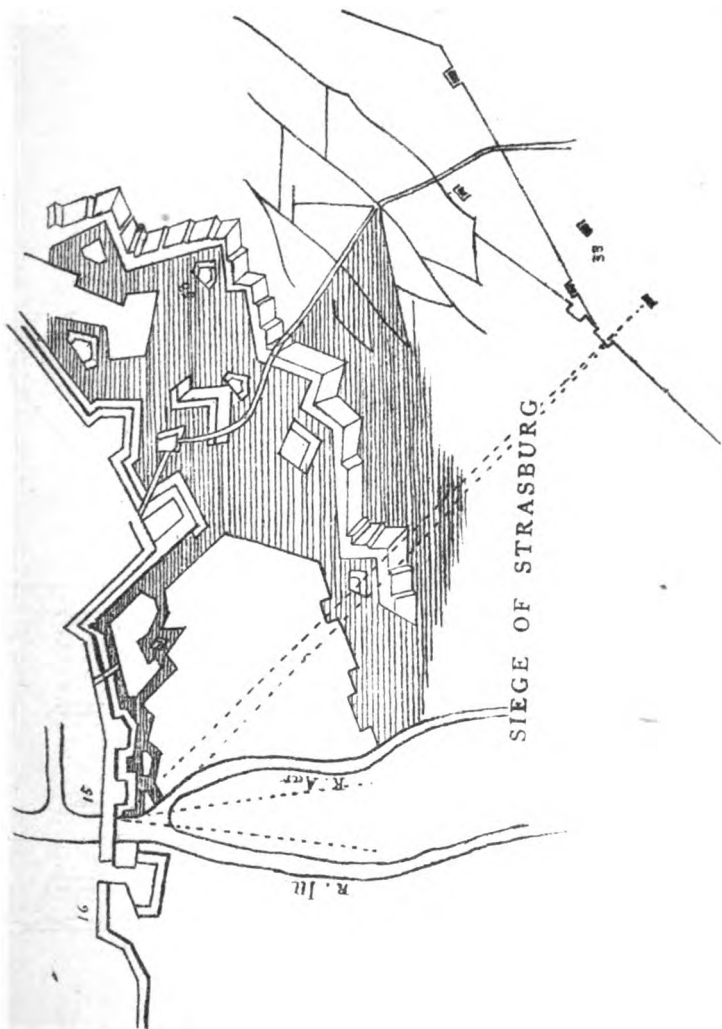
In these days of long-range small-arm breech-loaders, breaching-batteries, as I before explained, have to be opened at considerable distances, and often in such positions that they may be built and armed without observation: the gunners, therefore, labor under the disadvantage of not being able to see the object of fire. The masonry of a fortress being covered by the glacis, the shell must be made to lob over the crest of the glacis or projecting counter-guard, and strike the escarp-wall sufficiently low down for the *débris* to form a practicable breach (figures 6, 7 and 8, plate 3). This means a curved trajectory, or a considerable angle of descent, necessitating high elevation and low final velocity, combined, of necessity, with diminished penetration and accuracy, demanding considerably more skill from the gunners than the old method of direct fire at short range.

For curved fire, the distance of the batteries from the work being known from the map or calculated by range-finder, the required angle of descent must be ascertained by construction from profiles of the fortress, and the amount of the charge that will give such angle found from tables or calculated. Some visible part of the work directly above or near the spot of the required breach is selected, and fired at with a given number of rounds, to find the point of mean impact, which is then transferred to the spot intended to breach, calculating the decrease of elevation and the amount of deflexion to the right or left. A horizontal cut is first made in the masonry, about one-third ($\frac{1}{3}$) the height of the wall from the bottom (plate 3, figs. 6 and 7).

TABLE No. 4.—SIEGE OF STRASBOURG.

Against Citadel.	Against Town.	NATURE.	No. of Rounds said to have been Fired.
16	30	Long B. L. R. 24-Prs.	28,000 Shells (5,000 of them Shrapnel Shells).
.....	12	Short B. L. R. 24-Prs.	45,000 do. do. do.
16	64	B. L. R. 12-Prs.	11,000 Shrapnel.
.....	20	Ditto 6-Prs.	8,000 Shells and 4,000 Shrapnel.
.....	2	Rifled Mortars of 8-3-in.	600 Shells.
.....	19	Mortars, 50-Prs.	15,000 ditto.
4	20	Mortars, 25-Prs.	20,000 ditto.
.....	30	Hand ditto, 7-Prs.	23,000 ditto.
8	.....	Mortars, 60-Prs.	3,000 ditto.

FIG. 5



SIEGE OF STRASBURG

2000
2000
2000
2000

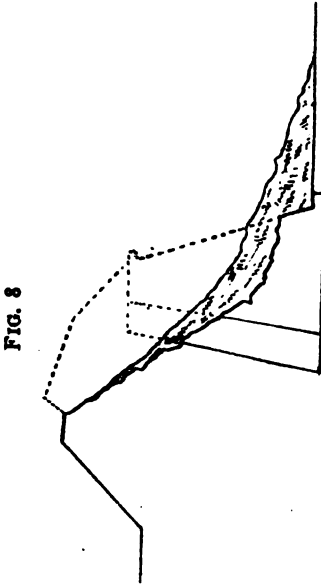


FIG. 8

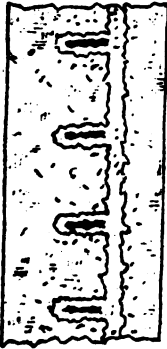


FIG. 7

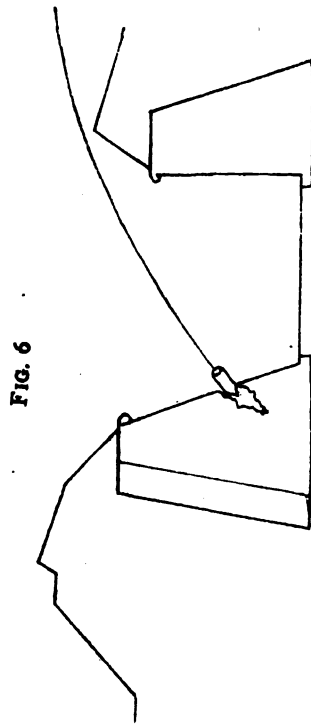


FIG. 6

BREACHING BY CURVED FIRE

100
100
100
100
100
100
100
100
100
100

When this cut is supposed to be effected by a series of shots, vertical cuts upwards are then made from the extremities of the horizontal one, and intermediate cuts made until the wall comes down (plate 3, figures 7 and 8); but this extreme theoretical accuracy is not obtained in practice, especially when the completion of the first horizontal cut can only be conjectured from certain phenomena, viz. :

(1st.) The concussion and explosion of a shell has a hard, sharp sound, if it hits solid masonry; on the other hand, it has a hollow and faint sound if it hits masonry either wholly or part broken through—in this latter case, the shell exploding in the earth behind the wall.

(2nd.) Fragments of stone are hurled into the air as long as the masonry resists.

(3rd.) The smoke from the explosion of the projectile soon rises above the wall, is of a bluish tinge, and forms a "ball" if the masonry remains intact. If the masonry has been broken through, the smoke appears after some delay, is of a darkish grey colour, and rises slowly, as if coming from a chimney-pot.

The determination of the range, Lunette No. 53, took a long time, as the range-party in a trench between the second (2nd) and third (3rd) parallels could see the glacis, but not the wall to be breached; and as there was no telegraphic communication, the report of each shot had to be sent by a chain of posts along the trenches to the batteries (plate 2, fig. 5).

The elevation varied on different days, on account of heavy rains and meteorological causes, when the horizontal cut was half-completed. A system of counter-mines in front of the Lunette was penetrated from the third (3rd) parallel

through a gallery driven by the German engineers. From the opening of this gallery in the counter-scarp the effect of fire could be accurately obtained and reported to the batteries. The horizontal cut was found far from perfect: many shells, striking above the intended line, gradually shook the whole wall; while the lower part was cut through, until great masses came down, followed by earth, so that it was not found necessary to make vertical cuts. A great number of the shells, with large bursting-charges, were finally fired into the earth of the parapet to bring it down.

The breach had a slope of 35° .— It was not defended, though there was a wet ditch at its foot.

There is a very interesting description of the passage of the ditch in front of Lunette No. 52 given in the Royal Engineer Papers, by Colonel Lennox, Royal Engineers; and in the Royal Artillery Institution Papers, a translation by Captain F. C. H. Clarke, Royal Artillery, from General Von Decker's Report, containing a description of the above operations, together with the partial destruction by curved fire of the unseen sluices which retained the waters of the ditch and inundation, which added to the difficulties of the siege of Strasbourg.*

It would be interesting, if time permitted, to go into the reasons why no breach was defended in the late war by the troops of a nation celebrated for the obstinate, bloody, and often successful defence of breaches assaulted by as dogged an enemy as any known to history, namely, the British infantry.

* NOTE.—My acknowledgments are also due to the professional papers of Colonel Smyth, R. A., and Captain Parnell and Lieut. Frazer, R. E.; of Col. Denfort Rocherau, Corps du Génie; as well as to German official accounts, &c., translated by the War-Office.

The change in weapons, especially the introduction of *mitrailleuses*, since the Peninsular war, was thought by many to be favorable to the defence of a breach by resolute soldiers.

SIEGE OF BELFORT.

The garrison of Belfort consisted almost entirely of Mobiles: only a very small proportion were troops of the line; among these, the 43rd regiment distinguished itself, as it did also at the subsequent siege of Paris.

To make the preliminary preparations of defence, there was only a half-battery of regular artillery and 4,500 Mobiles, without instruction or sufficient instructors,—there being only three officers of the *Corps du Génie* and two civil engineers acting as auxiliary. To these, four battalions of Mobiles, *en blouse*, badly armed and totally uninstructed, were subsequently added; and some 5000 *Franc-tireurs*, commanded by an energetic captain of artillery, held outposts.

The attacking force was supported by the army of General Von Werder, but threatened by Bourbaki. Bombardment was first attempted, with but so little success that a regular attack was commenced.

The north side was the most favorable for the operation; but, as the citadel on a hill dominated the country to that side, a second special siege of the citadel would have to be undertaken after the capture of the town and outworks.

On the south, the twin-hills of *les Perches* rose to a height about equal to the citadel-hill, and about twelve hundred metres from it: they were occupied by temporary field-works (redoubts), with a garrison of four hundred men each (plate 7, fig. 13). Before commencing the attack

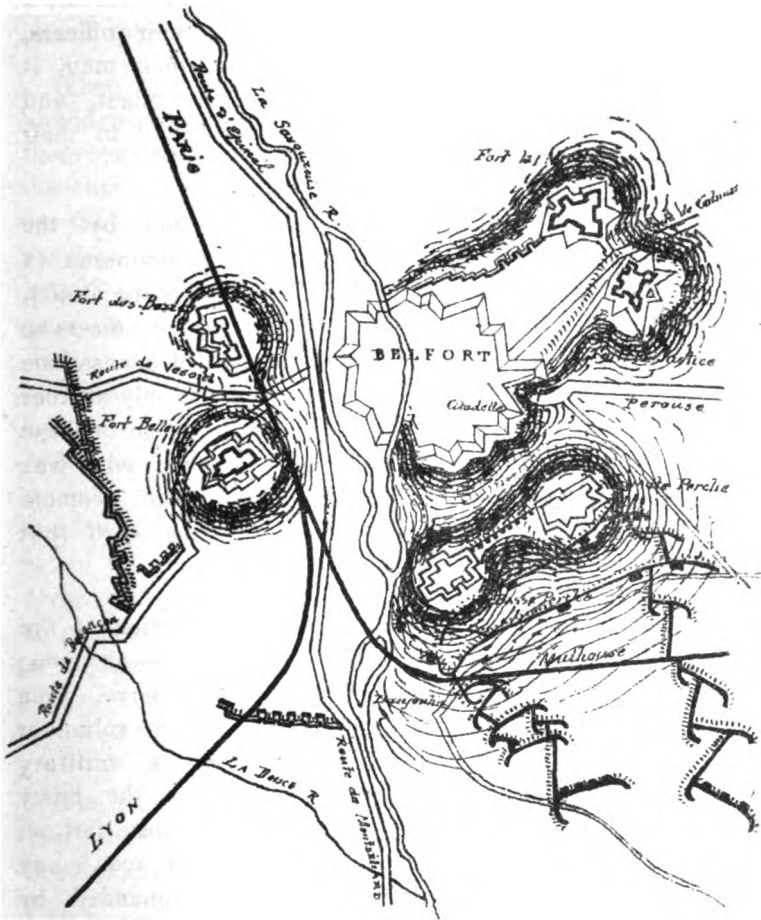
on these redoubts, it was necessary to capture the villages of Daujoutin and Perouse. The former was taken by a night surprise. Two German companies passing along the railway-embankment unperceived, the French Moblots guarding this point having been left by their officers, who were passing the evening in a tavern, their men, it can easily be understood, were not over-vigilant, and took a panic, which was rapidly communicated to their comrades.

The appendix to the journal of the siege by the commandant of the place, Colonel Denfort Rocherau (a brave and reliable French officer of the *Corps du Génie*), contains a mass of mutual recriminations by the officers so disgracefully negligent, who make all sorts of accusations against the commander of the post, which are only another proof of the worthlessness and want of discipline of these irregulars. An officer of the Royal Engineers, who was present during the siege, speaks of the pitiable spectacle presented by the panic-stricken mob in the garb (but without the feelings) of soldiers.

It must be remembered that a large proportion of the German attacking-force were not regulars, but Landwehr-men; but the Prussian militia (every man of which has served three years in the regular army, or one year as a volunteer of superior education, who has passed a military examination) is a very different force from the hasty levies of the French Republic, fed for the most part on bombast, clothed in shoddy, served out, in too many instances, with brown paper shoes, and commanded by eloquent *avocats*.

The German batteries against *les Perches* redoubts were screened by the woods of Bosmont. The first parallel was opened at 1,000 yards. The first assault, which advanced on a moonlight night over a light fall of snow, was repulsed.

FIG. 13



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Many Germans were taken prisoners in the ditch of the redoubt, the escarp of which they were not prepared to escalate, and could not climb. Regular approaches were then commenced, and flying sap used for the close attack (plate 7, figure 13).

When the works approached the redoubts they were abandoned by the garrison. A line of German batteries was then constructed along the ridge, about 1,000 metres from the chateau, at about the same level. The labor of bringing up the guns was enormous, as many as 100 men being required to drag each gun up the steep slope. The fire of the batteries on the ridge soon silenced that of the place. The guns on the open parapets below had suffered considerably. The Haxo casemates at the top of the citadel remained fairly serviceable, when the place capitulated. I have been told by the officer of Royal Engineers before quoted, who was with the German army, that the German commander had actually determined to abandon the siege, and that some of the investing force had actually been ordered to withdraw, when the place surrendered to a staff-officer sent to demand terms which he knew his commander was not in a position to enforce; but it is difficult for an outsider to be certain of the intentions of a general.

THONVILLE.

The capture of Thionville may be regarded as typical of that of the minor French fortresses, similar causes producing similar results.

It is a small fortified town, of about 5,000 inhabitants, in a basin about two miles in diameter. It commands the Moselle, several roads, and two lines of railway. It is just one of those cases where geological formation gives birth to a city, necessity for its fortification, incentive to its sieges, and, finally (with a change in weapons), the means for its

capture by establishing batteries on the surrounding hills commanding the fortifications, and affording every facility for enfilading the long faces of the Vauban trace. It was, in the first instance, invested by a handful of troopers (600) and a dozen or so of the engineer corps, who multiplied themselves by using a four-horsed coach to carry them from one threatened point to another, hastily fortifying various farm-houses.* By these means (what the Yankees would call a "bogus force") they imprisoned a garrison of 1,000 regular infantry and several thousands of Garde Mobiles, who the commandant declared to be unformed and unreliable to break the investment, which was maintained until the arrival of the investing force of 12,000 men, with 75 siege-guns, only 50 of which and 30 field-guns were put in position, firing principally on the barracks and arsenals, none of which were bombproof.

They opened a steady fire at a rate of one round every quarter of an hour, day and night. The shells, with percussion-fuses, descending from the heights, and concentrated on the town, told with effect on the buildings, but with little loss of life to the besieged, viz., eight killed and 66 wounded, two only of these being civilians.

I was much surprised to hear the loss was so small, on walking through the damaged streets of the town a short time after its capture, in company with a brother-officer. We had been refused access to the parapets by the brusque Teuton sentries. This was aggravating, as we had only a few hours to spare. Happy thought!—the high steeple-tower of a central church was conveniently loopholed with shell-bursts. We made for it, but here again were refused access, in spite of a silver key. The church was undergoing repairs; the custodian turned his back for an instant to superintend the

* Lieutenant-Colonel Smyth, R. A., Royal Artillery Institution Papers.

workmen ; we bolted up the stairs, and ensconced ourselves among the rafters of the belfry, from whence the shell-holes in the roof gave us a complete bird's-eye view of the fortifications and the position of every German battery. We had sold the watchful Teuton.

We were, however, startled on our perch by the tremendous vibrations of the huge bell, just above us, which warned us we had barely time to catch the train for Metz. Descending, we found ourselves, to our disgust, locked in, and the workmen gone. As a last hope, looking through the key-hole, we saw our obdurate friend locking the outer gate, and called to him. He opened the Sesame with violent abuse of our perfidy, declaring us "not true men, but spies," who would bring ruin upon him and his innocent family. He refused all *douceur*, begging us, in frightened accents, with many a look over his shoulder, to be gone and tell no one, "*pour l'amour de Dieu.*"

SEDAN.

In the old fortress of Sedan, situated in an almost exactly similar basin of hills to those around Thionville (plate 4, fig. 10), crowned by the German field-artillery, whose shells flashed upon the pavements and through the roofs of the old town at their feet, the chivalry of France laid down their arms, after gallant but fruitless efforts to break the circle of fire and steel that surrounded them.

METZ.

A court-martial has declared that the surrender of Metz and the splendid army under its walls was due to the political treachery of its chief, who basely falsified the proud boast of brave men, that "*La Garde meurt, mais ne se rends pas.*"

Without going into the details of the minor sieges, I will, if your patience permits, recapitulate what I think to be the *leading points of difference in the attack and defence, consequent upon the introduction of rifled guns and breach-loading small arms* :

1st. It is *no longer necessary, nor desirable, to carry on regular attack* until breaching-batteries are established on the escarp.

2nd. The long range of rifled guns has given a wide scope for the selection of *the sites of batteries, generally on the reverse slopes of distant hills, behind woods, &c., and in close proximity to railroads or good roads, facilitating armament and supply of ammunition.*

3rd. Breaching by curved fire, or *distant but concentrated bombardment, requires greater skill on the part of the gunners, and, consequently, higher training.*

4th. Embrasures, except in a few peculiar positions, being found to be shot-funnels for directing an enemy's fire to your own destruction, *a barbette system becomes a necessity.*

5th. *A system of range-finders, combined with accurate plans, on which the lines of fire can be laid down, as well as a system of telegraphing results of fire from a good point of observation, are also necessary.*

6th. *Complete tables of range and elevation for curved fire, with any given angle of descent deduced from the combined results of theory and practice, are a great want.*

7th. *The general introduction of rifled mortars, firing also vertical shrapnel, with a fixed charge and varying elevation.**

* NOTE.—Proposed by Captain Orde Browne, Royal Artillery.

8th. *The concentration of fire from dispersed batteries, admitting a large supplement of field artillery: the whole under the unfettered direction of an artillery chief.*

9th. *The complete investment in a very wide circle is a necessity which is practicable in the case of an inland fortress, besieged by an overwhelming force, but not in the case of a maritime fortress, unless the besiegers are masters on both land and sea.*

10th. *The cruel bombardment of a comparatively defenceless city in preference to attack, restricted to the fortifications, calls to mind the recommendation given in the book written for all time, as to the advisability of non-combatants leaving Jerusalem before the siege.*

DEFENCE.

These considerations lead us to the first principle of modern defence :

1st. *The necessity of keeping a besieger at arm's-length by superior artillery, so disposed and protected as to retain its power to the last. To my mind this seems practicable principally by a system of detached Moncrieff gun-pits, supporting each other and connected by troops in the field, who should cover themselves by temporary entrenchment, being physically and morally supported, fed, and relieved from the fortified city of which they formed the first line of defence.*

2nd. *The accumulation of munitions de guerre and munitions de bouche in fortified places of strategical importance, and the abandonment of the defence of such places as are not of vital importance.*

3rd. *An effective permanent garrison of trained artillery, familiar with the locale, the armament, and the stores on*

which they have to depend. They should be largely supplemented by an auxiliary volunteer citizen-artillery and infantry under discipline.

4th. *The advantages of such commanding positions as Gibraltar and Quebec, especially where the sea renders complete investment difficult against a maritime power.*

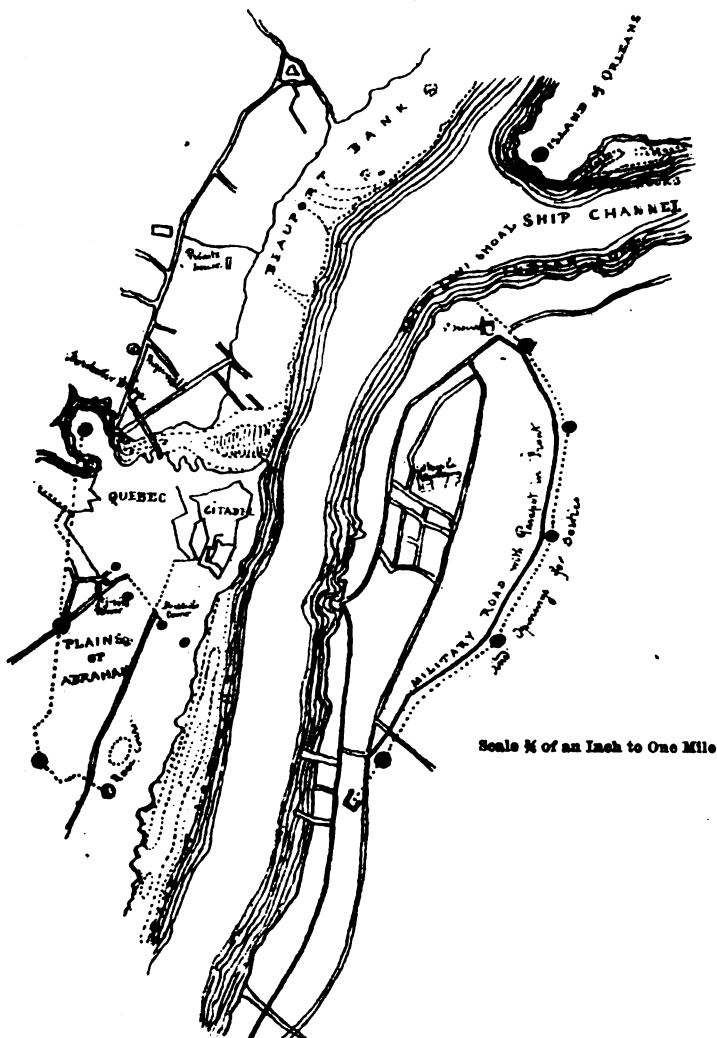
5th. *The great importance of bombproof cover, expense magazines, traverses, ample means of repairing material, and extemporizing cover.*

I would now consider how the above principles apply to the ancient fortress in which we live.

As artillery is obviously the most effective element of modern defence, its application should be developed to the utmost, and fortifications made subservient to it,—defence consisting, “*not of an armed system of fortification, but of a fortified system of artillery.*”

A besieger must be kept at arm's-length, which can only be done by superior artillery, so disposed and protected as to retain its power against attack, if not indefinitely, until such time as relief is at hand. As long as “*Britannia rules the waves,*” such a period would not, I trust, be indefinitely prolonged. Inland continental fortresses differ *materially* from the maritime strongholds of Great Britain. I can recall no instance in our history, since the loss of Calais, where the old flag has been lowered at the bidding of a besieger for want of succour from the sea, our great base of operations. Especially does it hold good in the case of a maritime fortress such as Quebec, where “*Field-Marshal Frost*” prevents the possibility of a longer investment than five summer months; and even in summer, the mighty sweep of the St. Lawrence would render complete investment almost an impossibility to an invader, who could not transport very heavy guns and their enormous weight of ammunition for a long distance over difficult country, with

FIG. 14



Scale $\frac{1}{4}$ of an Inch to One Mile

few and bad roads, impassable in the spring and fall.* The defender, holding the river within the circle of forts, could throw his *whole force on a section* of the enemy divided by the St. Lawrence and separated by it from their base of operation and line of retreat. The complete railway systems at the command of Prussia did not enable her to bring heavier guns than 60-pounders in her siege-train. There are certain physical data which do not alter, viz., the strength of men and horses; the badness of country-roads; and railroads, from the numerous other calls upon them in war, have been found incapable of transporting very heavy artillery. It is hardly to be supposed that the mistress of the seas and her eldest daughter, Canada, who already ranks third among the commercial navies of the world, would permit the siege-train destined for the attack of Quebec to be conveyed by sea. The armament, therefore, of Quebec might easily be superior to that brought against it, even by hostile iron-clads, whose unarmoured decks would be exposed to the Citadel fire, which, with the addition of a few torpedoes, would secure the St. Lawrence, if those upon whom the responsibility devolves considered the subject of sufficient importance to warrant a comparatively trifling expenditure.

It is not for me to comment on the acts of legislators holding the reins of Imperial or Dominion Governments; but the past legislation of defunct governments has gone into the region of history, and may be discussed. As a mere soldier,

* NOTE.—The coming winter will be the centenary of the expedition of Generals Montgomery and Arnold against Quebec. The former, with incredible hardships, came through the State of Maine, but returned not with his life; and the latter withdrew the shattered remnant of their force. Better had it been for his honor that he had shared Montgomery's fate ere he soiled his name by treason to his self-selected allegiance. The new forts at Levis completely command the intersection of roads and railways east, west, and south, as well as the valley of the Chandière and Kennebec road, by which the ill-fated Montgomery marched, and occupy the ground from which Wolfe shelled the town.

I was struck with amazement at what you probably did not notice, viz., the repeal, last year, with the concurrence of both the Imperial and Dominion Governments, of an Act of Confederation entitled the "Canada Defence Act," which provided for the transfer of the guaranteed loan of £1,000,000 for the defence of Montreal (the utterly defenceless commercial capital of Canada) to that political maelstrom, the Pacific Railway. At the same time, the Canadian Government declined the *free gift* of a new armament for the Quebec and Levis forts, provided for by the Canada Defence Act. The wisdom of declining to examine the dental development of an equine gift is proverbial; but the refusal of such a gift as the above was never dreamt of in my poor proverbial philosophy, nor in that of Mr. Martin Tupper, as far as I remember.

I have not yet been able to discover the epoch when Quebec ceased to be the key to navigation, by which British succour can come to Canada, or a hostile fleet of gunboats enter its inland waters, unless Reciprocity compels us to enlarge the Caughnawaga Canal, &c. In any case, unpleasant as the truth may appear to the valiant and self-reliant yeomanry of Ontario, Quebec would remain the only one possible stronghold upon which our militia, rolled up by an invading force from the west, could retreat, and wait for that help which never could be denied from the mother-land.*

* NOTE.—Successful initiative in war is everything. Both nations are forbidden by treaty to build gunboats on the lakes; but gunboats can and have, with the first note of war, passed up the St. Lawrence by the Lachine Canal, and on to the lakes. The Beauharnois Canal, on the South Shore (that monument to dead patriotism), would be rendered useless at the commencement of hostilities by the United States. But the necessities of commerce, with us stronger than any consideration of national defence, point to the probable enlargement of the old Canal on the North Shore, from the Cedar Rapids to Coteau Landing. The defenceless emporiums of commerce on the lakes would then be at the mercy of those who held Quebec.

Halifax is an open harbour, and useful as a coaling-station for the West-Indian fleet; but the treaty which handed over our compatriots of the State of Maine sends a wedge of territory up to within a few miles of the Intercolonial Railroad, which a handful of troopers could at any moment render unserviceable in a night, cutting off retreat to Halifax or succour from thence to the upper Provinces. 'Tis true that small detachments were sent from Halifax during the *Trent* difficulty, but the United States had "other fish to fry."

Assuming, then, a certain sum of money to be granted by the State for purposes of defence,—and *a very large sum, in the shape of rents of Imperial property, has been granted, though not, I believe, applied to that purpose*,—the maximum reasonable proportion of it should, I think, be appropriated to the application of protected artillery in the five important strategical points, viz., St. John, N.B., Quebec, Montreal, Kingston, and Esquimalt (the proposed terminus of the Pacific Railway in British Columbia).*

I am not singular in supposing that detached gun-pits on Major Moncrieff's system are the best means of meeting modern attack on an effective and sufficiently economical principle. With great admiration for the sister-service of the Royal Engineers, I cannot divest myself of the idea that they inherit not only the talent but the fancy for building in *Louis d'ors*, attributed to the French engineers by Louis Quatorze.

* NOTE.—For Ontario, trusting in the loyal strength of her militia, to be indifferent to the defence of Lower Canada, and especially of Montreal, resembles a warrior with a good helmet being indifferent about a cuirass for his stomach as long as his head was protected; or the much-maligned ostrich, who, on the approach of an enemy, stuck his beak in the sand and left his posterior exposed, believing it invisible. As for Montreal, it is said that modern Danæ is only too eager to embrace the trans-Atlantic bird of Jove, believing, as of old, that he will come in a shower of gold, which, however, may take the disagreeable form of *inflation*.

Laying aside costly iron shields, granite structures, and the ingenious devices for doing away with the destructive effects of recoil, Moncrieff simply trusts to the broad bosom of mother-earth, digs a hole for his gun, and chains the destructive giant of recoil an obedient slave to his gun-wheels.

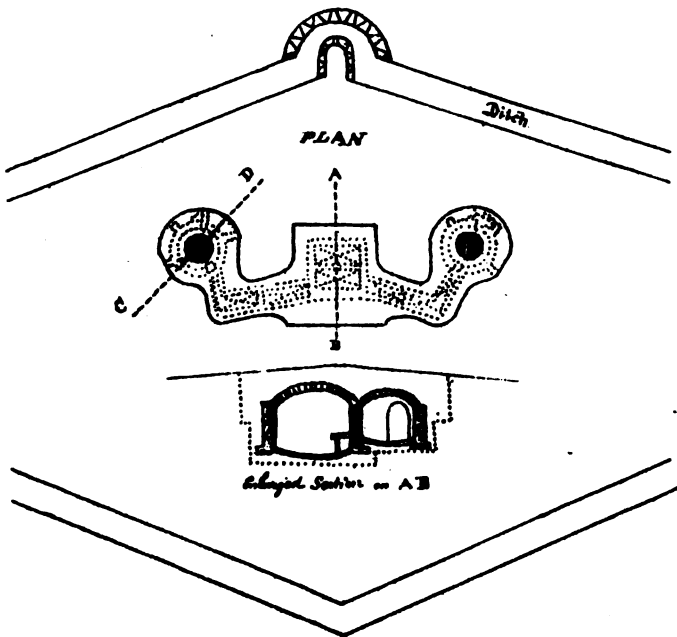
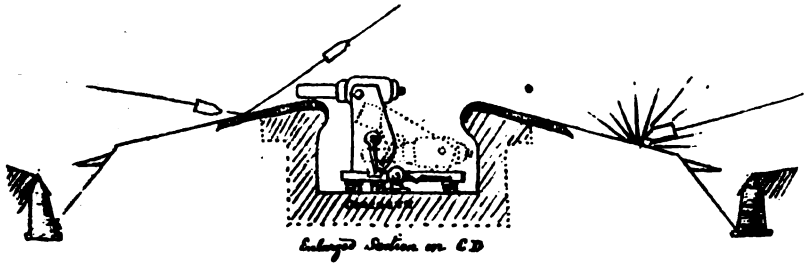
Time does not permit me to explain the system. I trust plate 6, fig 12, and the models, will render it intelligible to those who are not already familiar with it. As to its advantages, they are self-evident,—protection from direct fire while it gives an all-round fire, thus enormously increasing the value of a single gun, and its inexpensiveness, compared to the bastioned or polygonal trace, with ravelins, caponiers, &c.

Its only vulnerable point is liability to vertical fire ; but you who are riflemen may judge for yourselves of the comparative value of such an objection by considering the difference between hitting a visible upright target and dropping a shot upon the same target when laid flat on the ground. Besides, we must remember the saying of the first Napoleon : “ *On ne peut faire d'omelettes sans casser des œufs.* ” From no system of fortification can we expect entire immunity from danger in war. The actual expenses of the pits would be comparatively little. The principal outlay lies in the Moncrieff gun-carriage ; but as (by the Act so lately repealed) the British Government offered to arm the forts the Dominion Government would build, I thought the keen commercial intellect of Canada might have realized and adhered to the wise arrangement which left the principal burden on the richer mother-country.

It is not, however, to be supposed, in speaking of detached works in such positions as recommended by Colonel Jervois, Royal Engineers (as shewn in plate 8, fig. 14), with the view of keeping an enemy at a distance, that all the comparatively old fortifications are useless, from some inherent vice of construction ; quite the contrary. The fall of the French

MONCRIEF SYSTEM OF MOUNTING HEAVY ORDNANCE

FIG. 12



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fortresses is attributable to many causes which may seem far-fetched to you,—for instance, the geological formation of the Paris basin, which repeats itself at Sedan, Thionville, and elsewhere. These valleys caused confluence of rivers, as before remarked, the convergence of roads, and the growth of towns, to be in the future fortified by Vauban. The diameter of these basins was so large as to render the surrounding hills unavailable for the old artillery attack ; not so for modern guns, whose fire commanded and could converge upon the helpless town.

No such reasoning can be applied to the fortifications of Quebec, which, however, painfully remind me, in their dilapidation, their obsolete armament, and their scanty artillery garrison, of the state of some of the French fortresses at the commencement of the late war, when it was too late, as regards preparation, to obviate the apathy of peace, strangely co-existent with the delusive cry, "*à Berlin !*"

For the comparatively small sum of about \$40,000 (£8,000) an effective armament of rifled guns, as heavy as any that were brought against Paris, could be supplied to Quebec by selling some of the obsolete ones, getting the converted $\frac{3}{4}$ Palliser rifled gun, *for which the old carriages and stores would serve.** Any other system would necessitate the

* NOTE.—The same reasoning applies to the armaments at Kingston, Montreal, Toronto, and elsewhere, as I have pointed out in official Reports ; and no very heavy armament is required at present in Quebec, as there are no cis-Atlantic iron-clads capable of resisting a 7-inch M. L. R. projectile, nor even a 64-pounder, which, if fired from the Citadel command, would penetrate the light-armoured deck and knock a hole through the unarmoured bottom, unless it was thought preferable to burst the shell between decks. Though Dominion Inspector of Artillery, my visits have been officially restricted to the Province of Quebec. I must, therefore, be pardoned if my views have unconsciously taken too local a coloring. I have not, however, lost sight of the fact that the unprecedented development of Ontario and the self-reliant character of its people have modified the conditions set forth in the Report of Colonel Jervois, B. E., submitted ten years ago.

purchase of new carriages and other material, which would cost probably ten-times the above sum. The Government of India and that of Melbourne in Australia have purchased an armament of converted Palliser guns at comparatively small cost, such as I recommended two years ago for Quebec. I see they have been largely used at the miserable siege of Carthagen, in Spain, from which, however, we can learn little but the miseries entailed by the weak government of the clamorous many.

In its present unarmed state, a roving *Alabama* might run into such a position at Quebec as would enable her, under threat of bombardment, to demand from his honor the Mayor and gentlemen of the Corporation a sum that would far exceed anything they are likely to realize by the transfer of the late Imperial ordnance property from the purpose for which it was given. It is not desirable that I should point out our vulnerable points; suffice it to say that the lower lines, regarded by many as picturesque ruins, are of more importance than are dreamt of in your philosophy.