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THE  
PERIL OF PORTSMOUTH;

OR,  
FRENCH FLEETS AND ENGLISH FORTS.

BY JAMES FERGUSSON, Esq.,

AUTHOR OF AN ESSAY ON A PROPOSED NEW SYSTEM OF FORTIFICATION,  
&c. &c.

WITH A PLAN.



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**A Tribute**

TO THE MEMORY

OF

ENGLAND'S GREATEST MILITARY COMMANDER,

Whose last earnest Appeal to his Fellow-countrymen was a Prayer that they would arm to resist an Invader ; concluding with the following words :—

“ I AM BORDERING ON SEVENTY-SEVEN YEARS PASSED IN HONOUR. I HOPE THAT THE ALMIGHTY MAY PROTECT ME FROM BEING A WITNESS OF THE TRAGEDY I CANNOT PERSUADE MY CONTEMPORARIES TO TAKE MEASURES TO AVERT.”





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# THE PERIL OF PORTSMOUTH.

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## SECTION I.

### INTRODUCTION.

FEW persons are perhaps aware that Portsmouth, which from its position and its extent is by far the most important station of the British Navy, is at present in so defenceless a state, that it could easily be taken by a “coup de main,” either from the sea or by land. Yet such is the undoubted state of the case, and it is further easy of proof, that, if it were to fall into the hands of an enemy, the Navy of England would from that one circumstance be crippled—as a defensive element at least—to the extent of half its power; while the hostile occupation of Portsmouth would render the invasion of England as simple and as easy a problem as ever was submitted to the consideration of any military man. This being the case, the following pages are written in the hope of being able to prove two propositions. The first is, *That Portsmouth, owing to its singularly fortunate position, may at a small expense be so fortified as to be practically impregnable.* The second is, *That its being so fortified would have a more favourable effect in the defence of England from invasion than any measure which has hitherto been proposed.*

To their author these propositions seem as clear as the sun at noonday; whether or no he may be able to make others view them in the same light remains to be seen—at all events, however, their importance is such that no apology seems to be required for bringing them forward at the present moment.

To make the matter as clear as may be, it will be requisite to say, first, a few words on the subject of fortification generally, and the mode in which its acknowledged defects are proposed to be corrected; and secondly, to describe the defences of Ports-

mouth as they at present exist, stating the mode in which it is proposed to remodel them, taking the sea and land defences separately, and describing the one before taking up the other.

The second part of the work will be devoted to the general question of the invasion of England, and the effect which the proposed fortification of Portsmouth may have in averting that calamity.

The great and almost insuperable difficulty in bringing forward a subject of this sort is, to obtain a fair and intelligent hearing. All military men, not only in England, but all over Europe, have been educated according to a system which has obtained the sanction of the greatest names in modern times, and has now the prestige of a very tolerable antiquity; and though its faults and defects are admitted on all hands, every attempt to remedy these and improve upon the system has in practice unfortunately proved a failure, a circumstance in itself more than sufficient to justify military men in looking with extreme caution and suspicion on any new proposal of the sort.

On the other hand, an appeal to civilians presents even more difficulty, for there are not, so far as I know, half-a-dozen in the united kingdoms who have mastered the subject to a sufficient extent to be prepared or competent to give a valid opinion on the merits of the question. At the same time, all students of modern history—and their name is legion—could authoritatively point to the experience of all the wars of the last two centuries to show that all fortifications have proved useless for the defence of a country, being generally more hurtful to those who constructed, than to those whose lot it was to attack them.

This certainly was the case in the thirty years' war, when, the armies of Germany being dispersed in small bodies garrisoning fortified towns, Gustavus Adolphus was enabled to march from one end of the country to the other, and cut them off in detail. So it was in the seven years' war; without fortified places the concentrated armies of the Empire would have at once overwhelmed Frederick the Great. So too in the time of Louis XIV. the barrier fortresses of Belgium did not prevent his occupying that country, while they enabled him to hold it with comparatively few troops, and to base further operations on fortifications it did not cost him half the time or money to take which the erection of them had cost the natives. But the crowning argu-

ment against the system is drawn from the wars of the French revolution and the campaigns of Napoleon ; it is hardly too much to assert, that no conquest was even retarded, no campaign disconcerted, by the numberless fortifications which covered the face of Europe, but that, on the contrary, those very fortifications served as *depôts* and “*points d’appui*,” without which it would have been far more difficult to hold the conquered country.

Two Spanish examples may be quoted in contravention of this—the lines of Torres Vedras and the Castle of Burgos. The former forced Napoleon’s generals to evacuate Portugal, the latter threw Wellington back on his resources and disconcerted a whole campaign. So far as these examples go, they prove that it is not the fact but the system which is at fault ; for while all works built “*selon les règles*” fall like card houses, field-works, constructed in haste according to no system at all, may resist even those who never failed before.

It only requires, however, to go a little further back in the history of the art of war to find another and very different state of matters : before the reign of Louis XIV. it was only required to build a wall sufficiently high, and dig a ditch deep enough, to render a city practically impregnable ; or to improve some natural advantage so as to render a castle secure against attack. In those days invasions were difficult if not impossible—the citizens sufficed for the defence of their own walls, and the baron and his retainers could hold his castle against all comers. Standing armies were consequently unknown, and a spirit of manly independence and self-reliance existed which has perished long ago before the levelling centralization necessary to supply the absence of this most indispensable of the arts. Singularly enough it has perished just at the time when it seemed on the point of realizing an overwhelming preponderance, for there can be no doubt, the invention of gunpowder ought to have told principally in favour of the defence, from the power it gave of flanking distances which could not be reached before, keeping the enemy at a distance, and destroying any works he might erect. The result, however, was widely different. The inventions of Vauban and his contemporaries showed how fortresses could be quickly and inevitably destroyed ; and gave that superiority to the art of attack which it has ever since retained—not however without protest on the part of many well qualified to judge the question,



but hitherto unfortunately without any one having been found, not only to see the defects, but also to suggest the remedy, with perhaps one notable exception in Montalembert. He, at the end of the last century, saw clearly where the error lay, and grasped as clearly the idea, that the only mode of applying a remedy was to give the fort a superiority of fire over the attack ; when however he came to reduce this to practice he failed signally. His suggestion was to build enormous masses of masonry and pile casemate on casemate, wholly forgetting that exposed masonry is easily destroyed by the besieger, even without his showing himself ; and that casemates, when attackable, are far more destructive to the besieged than to the besieger. It was easy, therefore, to show the fallacy of this remedy and to put it aside. His friend Carnot saw the defect of existing systems as clearly as he did, but he also saw the defect of Montalembert's, and rushed into the opposite extreme of hiding everything, abandoning all direct fire, and trusting wholly to the effect of vertical fire from unseen batteries. As is generally the case, the true remedy lies somewhere between the temerity of the one and the timidity of the other ; but where it lies still remains to be specifically pointed out.

The French, who have had little or no experience in *defensive* warfare, still adhere to the antiquated system of Vauban, and are erecting forts that can easily be taken, and must certainly fall within a given number of days whenever attacked "en règle." The Germans, knowing from fatal experience how impossible it is to defend fortresses built according to the received systems, have adopted almost universally the proposals of Montalembert, and within these last few years have, at an enormous expense, erected great masses of masonry, which will crumble about their ears whenever attacked, and in doing so will not only open their defences, but will prove destructive to the garrison to an extent hitherto unknown.

In Belgium, too, the same system has been adopted. Since the peace upwards of ten millions sterling have been spent in erecting some twenty fortified places, one-half of which, by a recent decree of the Belgian Government, are to be abandoned, as it is found that the remainder will require 70,000 men to garrison them, an army which, if free to act, and properly handled, ought to be a powerful instrument of defence, but which, if shut

up in fortified places, will not for one hour retard the fall of the capital or the occupation of the country. Once the country is in possession of the enemy, if treachery or intimidation will do nothing, the invader will only have to detach such bodies as are required to take any of the fortresses he wants, in twenty or thirty days, according to their class, and at leisure subdue each in succession, if they hold out; this done he can hold the country with one-half the force which would be required if it had no strong places, as in that case the invader must always be prepared to put a stronger force in any given spot than a liberator can place there, but with the fortresses in his possession, and his resources immediately in their rear, he can choose his own time and opportunity, and act as he pleases.

This being the case, had I nothing better to propose than to fortify Portsmouth and other places in England according to the received systems, I would rather use my pen to persuade my countrymen to raze to the ground those fortifications we now have. Their garrisons would be a serious deduction from the numerical force of our small army, and, though they are not strong enough for us to defend them successfully, they would be of immense service in enabling an invader to hold the country, which without some fortifications would be nearly impossible.

I am, however, convinced that it is a mistake to suppose that the art of attack must be superior to the art of defence. The remedy is, I believe, simple and easy, and consequently places may be made as impregnable as before the invention of gun-powder; and invasion may therefore be rendered a far more difficult thing than it is in the present state of the science.

In a pamphlet like this it is of course impossible to go into the principles of a science, or explain its technicalities; and in the present instance this is the less required, as the whole system was published, with the reasoning on which it is based, in a small volume accessible to every one; I shall, therefore, assume the fundamental principles as known, referring the reader who is desirous of further information to the work itself.\*

Although perfectly aware of the difficulty that must exist in a civilian obtaining a hearing on a subject hitherto considered so

\* Essay on a proposed new System of Fortification, with Hints for its application to our National Defences. By JAMES FERGUSON. John Weale, 58, High Holborn. 1849.



purely professional as this, I am by no means prepared to concede that not being a military man must necessarily be a disqualification from giving an opinion on such a subject. At all events, however, if a qualification can be obtained by a lifetime devoted to the consideration of the theory of the art, and the knowledge acquired by the examination of works in all parts of the world, from the rude but efficient mud forts of India, to the scientific but inefficient works of the modern French and German engineers, I believe I am entitled to give an opinion on the subject, in which there appears to be no mystery except the despondency with which engineers regard its possible progress towards perfectibility.

At all events, the subject is so immensely important, the safety of the nation from foreign invasion hinges so completely upon it, that I conceive it to be the duty of military men either to suggest a better and cheaper plan for effecting this object, or to give this one a fair and impartial consideration. If they do neither, they neglect their duty to their country and to the profession to which they belong.

Hitherto no objections have been stated to my New System of Fortification, except such as arose from an imperfect knowledge of what was proposed. Many, it is true, have been repeated to me as current at the mess-tables at Woolwich, Chatham, and elsewhere.

One officer, for instance, objects that the system is identical with Carnot's, because I use circular lines, and in one instance recommended something like a Carnot-wall for a revêtement—the truth being that my system is diametrically opposed to his, inasmuch as mine is based wholly on a preponderance of fire, which his utterly ignored; and the celebrated Woolwich wall, which was quoted on the occasion, rose ten feet above the level of the country, and was imperfectly covered by the counter-guard in front, whereas the crest of mine was forty feet lower, where no shot fired at Woolwich would or could have reached it.

Another officer objects that it would require an army to garrison a fort of the proposed construction, because he avers, if a fort of the ordinary construction mounting 100 guns requires 4000 men, a fort mounting 1000, must require 40,000: the fact being that a siege train of 100 guns, brought against a fort of the ordinary construction, would more than suffice to destroy

it; if constructed on the proposed system, 200 guns and 1400 men would more than suffice to prevent their ever opening a battery, and with higher numbers a less proportion would be sufficient.

Another would shell such a fort as I propose to construct; I wish he would calculate how many shells it would require to shell down a rampart 500 feet wide, and sloping at an angle of only twelve degrees to the horizon, and try the same calculation on a rampart 60 or 80 feet wide and perpendicular on its principal face. Taking the widest margin, as nearly as I can calculate, one shell would do more damage to a fort of the ordinary construction than twenty would to those I propose.

Frequently I have heard objections made on the score of expense, whereas a study of the work would prove that the expense of a fort of the proposed construction is very rarely one-fourth part of that of one of the ordinary construction, and frequently only one-tenth. And so I might go on through fifty objections more baseless than these, but till they are put in a tangible form it is but fighting with shadows to attempt to refute them.

There is one exception to those who object without having studied the system—Lieut.-Colonel Adams, Professor of Fortification at the Military College at Sandhurst. Personally he was utterly unknown to me, until he proposed to deliver a lecture on my system at the United Service Institution in Scotland Yard. The lecture was delivered on the 29th May last, illustrated by the model prepared for the Great Exhibition, which still remains in the Museum, and in the presence of many important military authorities; one of whom, second to none in the British Army for experience and ability, remarked after the lecture, that the system was destined to revolutionize the art of defensive warfare, and that we should again hear of sieges of ten and twelve years—wars of Troy over again.

This lecture was published as delivered, in the *United Service Magazine* for July, and is reprinted by the author's kind permission as an appendix to the present volume.

This therefore may be considered as a distinct challenge to the Service; for though they may feel themselves justified in disregarding what a civilian may say on a subject which is generally considered as strictly professional, the same reasoning will not

apply to a brother officer, and one especially selected as the best fitted in the army to convey instruction on the subject in the most scientific military institution in this country. If these opinions of his are heresies, they ought to be refuted ; if however they are correct, they ought to be admitted, for it is a useless waste of public money to go on fortifying according to the old system when one-tenth of the money would do it better, and it is a wilful neglect of the public safety to court defeat when victory is easy and assured.

For myself I can only add, that since the work was published I have seen a good deal—heard and read much—and thought long and deeply on the subject, and everything which has occurred in the interval has only tended to confirm me more and more in the truth of what I then asserted. If I am wrong, there is nothing so easy as to show it. My system is not a “Long Range,” or secret scheme of destruction, it is all open and aboveboard, and has been publicly stated and published without reserve. If there be a flaw in it, let any officer or competent person show how he could attack either one of the theoretical forts given in my book, or this proposed mode of defending Portsmouth, stating the number of guns and men he would require, the mode in which he would approach the edge of the ditch, and how he would pass it when he had advanced so far. If he can show this and I cannot confute him, I am willing to give in, but till this is done I may be allowed to claim for my system the impregnability which I honestly believe it to possess, and which I must at least assume throughout the following pages.

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## SECTION II.

## SEA DEFENCES.

TURNING from these generalities to the particular subject under consideration, there are two modes by which Portsmouth may be attacked—first, by a hostile fleet passing the batteries and entering the harbour; the second, by landing troops and storming the land defences.

The former is the one which we shall consider first.—It could scarcely be effected by sailing-vessels, as it would require a strong leading southerly wind, which could hardly be depended upon or obtained without the chance of waiting so long for it as to afford time for such preparations of defence being made as would render success extremely doubtful. Nor could it be effected by paddle-wheel steamers, as their broadside armament is so powerless; and the batteries are singularly well placed for hitting or disabling their paddles or those parts of their machinery necessarily above water. But it could be attempted by screw line-of-battle ships; and if I am not very much mistaken, with every prospect of success. The French now possess four such ships—the Napoleon, the Charlemagne, the Austerlitz, and the Jean Bart, and are understood to be building others. These vessels carry from 90 to 100 guns of the heaviest calibre, and though the speed of the Napoleon is probably not so great as reported—thirteen to fifteen knots per hour—they are all equal to at least ten knots per hour in smooth water, and with a flood tide in the springs, both of which they could easily command.

At this rate of speed about ten minutes would elapse from the time when they first came within effective reach of the guns of Southsea Castle\* till they were safely past all danger and anchored inside the harbour.

\* I take the effective range of guns of ordinary calibre to be about 1000 to 1200 yards: beyond that distance the aim against bodies moving at the rate of 10 knots an hour is very uncertain; and though at an elevation of 5° most



During one half of that time the only guns that could reach them are those of Southsea Castle ; for the remainder they would be under the fire of the more formidable batteries of the town.

The question is, what damage could be done to them in this time ? Let us follow the course of the leading ships a little more closely, and perhaps we may be able to judge.

The first obstacle is Southsea Castle, within 600 yards of which the vessel must pass. This fortress was built by Henry VIII., and consists of a tall square tower or keep, on the top of which three or four small guns are mounted ; on each side of this is a semicircular wing carrying three or four more guns, looking over a weak and insignificant stone parapet ; and outside the ditch there is one gun on the right flank, and three on the left—on traversing platforms looking over an earthen glacis ; these four being the only really effective guns in the fortress. As before stated, a vessel would be under the fire of the Castle rather more than six minutes, but it is only when immediately in front, that more than half of its guns could be brought to bear on the vessel at one time. If she were to anchor in front and attempt to play at long bowls with the fort, she might, it is true, receive some heavy blows ; but she could afford to disregard the fire of four or five small guns till immediately opposite, when, approaching as near as the soundings will permit, one broadside would probably finish the defences of Southsea Castle for ever. The guns, except four, being wholly surrounded by masonry of a very second-class order, the splinters would probably dismount every gun, even if it were not actually struck, and kill or wound the garrison to such an extent as would render the immediate resumption of firing impossible, and, at all events, render it a very easy task for the second ship to complete what her consort had begun ; for even the guns outside are jammed so closely to one another, that it is almost impossible they should escape.

Having passed this danger, the ship would next come within range of five guns mounted on the ravelin to the left of the King's Bastion, and as many on a flèche to the right of it ; the direction of the former is best, but it is distant ; and as the ship need never come within 800 yards of it, every shot would not tell, and in

guns will carry a mile and even more, the chance of their hitting a ship coming stem on is very small ; and their power of doing damage is considerably diminished by the distance.

less than three minutes it is shut out of view ; while, owing to the confined space in which the guns are placed, a broadside would do it considerable damage. The flèche only sees the vessel, end on, till its embrasures prevent the guns seeing her at all.

The faces of the King's Bastion are singularly ill placed for batteries against shipping, and have only two guns mounted on them in consequence ; but by far the most formidable of the defences in this quarter is the long curtain to the right of the King's Bastion : it now carries nine heavy guns on traversing platforms, and behind earthen parapets ; and if the useless traverses were removed and the battery extended, it might mount twelve or fifteen ; as it is, their direction is excellent, and, there being no masonry, a ship's broadside, though it might create dust, and dismount one or two guns, could not seriously damage such a battery, but it might create such a confusion as to enable the ship, going at ten knots, to pass without serious injury : this battery, however, is what she has most to fear ; passing it, the platform-battery, of course, may be disregarded, and she then opens the new casemated battery on the Point : it mounts twelve formidable guns, but, being in casemates, their own smoke would prevent their being fired twice with anything like precision, at least during the time the vessel is within range, and before, or at least as soon as, the guns can see the ship, the ship's broadside could be poured into the battery ; and though the embrasures are not funnel-shaped, the destruction by splinters and the shot pouring into so confined a space would probably silence the batteries at once. Besides these, which would all see the ship's side, there are four guns on the flank of the platform-battery, which would see her end on, six are in an orillon of the Point-battery in two tiers, and casemated, so as to render them nearly ineffectual, and twenty-four guns on the Blockhouse fort, likewise in two tiers, the lower casemated, with wide, gaping, funnel-shaped embrasures, the upper in masonry embrasures of equally bad shape but not casemated. None of these guns would ever see the side of the advancing ship, but only her stem, presenting, consequently, a much smaller target to hit ; but on the other hand, she would be only able to reply from her bridle-ports, so that the gunners would be tolerably free from molestation ; and if a shot did penetrate through the bows it might rake her fore and aft and do considerable damage. These batteries, however,

being in two tiers, the smoke of the lower guns would prevent the upper from seeing what they were doing, and, being casemated, their own smoke would be a serious obstacle to quick and precise firing. Probably the best plan for a ship in such circumstances would be to close with her bridle-ports, coil her hemp cables in her bow, and stow there her hammocks and spare sails, in which case she would have little to fear from any of the guns; and when she could, in turning into the harbour, pour her port broadside into the Blockhouse fort, she would create such ruin as would render the work very easy for the ships which had to follow. Both the Blockhouse fort and Point batteries being mere casemated works of masonry, their effect in resisting the advance of a line-of-battle ship would not be more than if a fifty-gun frigate were moored where the former is placed, and a twenty-four gun corvette where the Point battery is: if they could stop four line-of-battle ships, so could these forts, but if they could not, the forts certainly would be unable to do so.

It is not, of course, contended that this would be an easy manœuvre, or that the leading ship could enter the harbour without some very heavy blows, and many of her crew being killed or wounded; but it is child's play in comparison with what ships have done before in action, and will do again: the time of action is so short that even the effect of hot shot is hardly to be feared; and shells fired horizontally tell nearly equally on both sides of the question.

To put the question in another light. If Portsmouth were a foreign port, and a squadron composed of such ships as the Duke of Wellington, the Agamemnon, St. Jean d'Acre, Sans Pareil, were fitted out to force it, I would not ask such men as Lord Dundonald, Sir Charles Napier, and others, who have done far more desperate and daring things; but I will undertake to say there are few admirals or officers in the British Navy who would not gladly volunteer to command or serve in such an expedition. Were it proposed, I fancy the Admiralty would be besieged with aspirants as it has seldom been besieged before; and I believe there would be few things more acceptable to the French navy than to hear of their four vessels above named being ordered for the service sketched out above.

It would, of course, be necessary that the storming squadron



should be supported by a sufficient number of sailing men-of-war to engage and neutralise any ships that might be found at Spithead, or elsewhere ; when once they were in the harbour their task would be done ; not one single gun could be brought to bear on them ; nor is there a place where a gun could be put ; and it would therefore be for the consideration of the governor, whether he would surrender at once, or have the town and dockyard knocked about his ears and burnt, and then give in, which he inevitably would be forced to do, however brave or determined he may be.

So little am I singular in stating that all this can be done, and done easily, that I believe almost all sailors, and soldiers too, are of opinion that it is impossible for batteries to stop ships. General Lewis, for instance, writes, in the 'Aide Mémoire'\*—“No battery or batteries, however strong, can stop or prevent any ship of war or steamer from entering a harbour when the navigation is free, and the course is nearly direct, if she chooses her own time. As examples, the conquest of Curaçoa is one on a small scale, and the passage of the Dardanelles another on the largest.” This opinion was written before screw line-of-battle ships were invented, or such speed as is now common was thought to be attainable in vessels of any class.

Notwithstanding all this, I feel convinced that this opinion is based on mistaken principles ; and, confining ourselves to Portsmouth alone, it is clear that the defect there arises from the guns being scattered in small detached batteries, and, with the exception of the right curtain of the King's Bastion, all in unfavourable directions ; and more than this, from those guns which have the best direction being placed in masonry casemates, by which their efficiency is practically destroyed. As casemating, however, is one of the most important questions connected with the subject of harbour defences, it is necessary before proceeding farther to examine it a little more closely. But before doing so, I may notice another proposal which has, I believe, been seriously entertained. It is, to sink two block-ships in the mouth of the harbour, in the event of such an attempt as has been described being made.

I question, however, if this would be more effectual than the

\* Vol. i. p. 282.



chains we hear of as drawn across harbour-mouths in early days ; but even supposing that it would be, it bars egress as well as ingress ; and all an invading fleet would have to do would be to make a feint at the harbour-mouth, and, having got the block-ships fairly sunk, it is safe from any interruption in landing beyond Stokes Bay. The manœuvre would, indeed, probably tell more seriously against, than for us, and might, besides, permanently injure the entrance of the harbour ; for such a rush of tide as goes in and out there, is not to be trifled with. If it were our only expedient, it might, of course, be resorted to ; but as what I am about to propose is both cheaper and more certain, it need not be more seriously discussed.

#### CASEMATES.

The object of covering guns with bomb-proof vaults, or of putting them into casemates, as they are technically called, is to protect them and the men who serve them from the effects of shells thrown from mortars, and falling vertically into the batteries. They are no protection against shot or shells fired horizontally ; and on the contrary, the disadvantages they are exposed to from the latter kind of fire are such, that French engineers generally decline to adopt them, except as flanking expedients in places where they cannot well be seen by the attacking party ; they object, and with great truth, that the smoke of the guns in casemates prevents either rapid or correct firing, the men after the first round being unable to see what they are about ; that the splinters from the masonry are far more destructive than any vertical fire can well be ; and damage once done can never be repaired, but goes on increasing in a geometric ratio ; and, lastly, that the expense is enormous.

Some of these objections may be obviated by using " Haxo casemates ;" but as these have never yet been used in batteries against ships, they need not be particularised here ; altogether the disadvantages so far counterbalance the advantages that the French are, perhaps, right in declining to use them, in their bastion forts at least ; and the employment of them is the objection which they consider fatal to Montalembert's system.

The Germans differ to some extent from this opinion, and are building casemates for guns to an extent, and in a manner, which I feel sure they will have cause to repent, whenever their forti-

fications are seriously attacked. But be that as it may, their employment at all is based wholly on the assumption that the attacking force can establish its mortar batteries behind an *épaulement* where they are unseen and unattackable by the fort; and after ascertaining as nearly as possible his distance, the engineer can first, by throwing one shell, which perhaps falls short, try a second, which may range beyond, and so on, till by altering his elevation he at last gets the range, and then can go on pitching shells with tolerable accuracy, so as to do considerable damage; but if the battery is at right angles to the attack, and wholly composed of earth, their effect is not much to be dreaded.

All this reasoning, however, applies only to mortars used from batteries on *terra firma*, against land defences. When we turn to ships we are startled to find that no line-of-battle ship or frigate in Europe or America carries a mortar, or has the power of throwing shells at all. There are, or were, in the British navy certain craft called *bomb-ketches*, carrying mortars, which they could use with sufficient precision to throw shells into towns—if tolerably large ones; but, as must be evident from a moment's consideration, the least motion of the waves, the smallest change in the direction of the vessel's head, even the men moving from one side of a small vessel to the other, would alter the range a hundred yards at least, and the vessel could never be sure of throwing two shells within several hundred yards of one another. Besides this, if a *bomb-ketch* were to anchor with the idea of silencing a battery, the superior accuracy and celerity of the horizontal fire of the guns on shore, and the greater vulnerability of the vessel, would very soon oblige her to haul off or be sunk.

To casemate guns, therefore, against the attack of ships is simply and absolutely useless; but it is worse,—rapidity of firing is of little importance in land-batteries, but in the case of batteries to be used against ships it is the essential quality to be sought for, in order to arrest objects moving at the rate of ten knots an hour; and as casemating destroys this, its effect is simply to deprive the battery of its principal use. But worse than even this: a five-gun battery on shore may destroy masonry in process of time; but for this purpose there is nothing in the whole world like the fifty-gun battery of a line-of-battle ship:

once brought to bear within moderate range on the masonry of a casemated battery, an earthquake or a mine could hardly be more destructive.

Our successes at Algiers and Acre were owing to the fact that the guns opposed to our ships were in casemates, or placed on masonry walls behind masonry parapets, which crumbled to dust before the fire of the ships; upsetting the guns, killing the men, and spreading devastation everywhere. On the other hand, I am not aware of a single instance of a ship of any navy in Europe being successful against earthen ramparts. Perhaps they have never been tried; nor is the experiment easy, as owing to a strange fatality it is the fashion in all fortifications, from Cronstadt to Gibraltar, to expose the masonry of their defences against ships, though generally covering up the masonry of their land defences. The following extract, however, from Colonel Mitchell's 'Thoughts on Tactics' (page 293) may illustrate its probable effect:—

“In 1809, eight sail of the line, under Sir Richard Strachan, passed Flushing, and kept up as they went along so tremendous a fire against the batteries, that French officers who had been present at Austerlitz and Jena declared, after the surrender, ‘que la canonnade’ in those battles had been a mere jeu d’enfants in comparison. Yet what was after all the effect produced on the defences of the place by this fire, so formidable, to judge by sound alone? The writer can answer the question with some accuracy; for he went along the entire of the sea-line the very day after the capitulation, and found no part of the parapet injured so as to be of the slightest consequence; and only one solitary gun dismounted, evidently by the bursting of a shell, which could not, of course, have been thrown from the line-of-battle ships, but must have been thrown from the land batteries.

“As a contrast to the feeble effect produced by so large a naval force against land batteries, we must here mention the result of another action fought in the same river at a later period of the war: it serves strongly to illustrate what can be done by good artillery against even first-rate ships. The small army that under Lord Lynedoch advanced towards Antwerp early in 1814 established a post in a bend formed by the Polder Dyke, at some distance below Lillo. The place is called Fort Frederick, though showing no appearance of fortification beyond the barely visible



sites of two embrasures: one of these was at right angles with the course of the river, whilst the other looked diagonally up the stream. A long eighteen-pounder was placed in the first, and a five-and-half-inch howitzer in the second. From this post the French determined to dislodge us; and on a very fine and calm morning an eighty-gun ship dropped down with the tide, and anchored near the Flanders shore, about 600 yards from the British battery; by her position she was secured from the fire of the eighteen-pounder, and exposed to that of the howitzer only. As soon as everything was made tight her broadside opened; and if noise and smoke were alone sufficient to ensure success in war, as so many of the moderns seem to think, the result of this strange contest could not have been long doubtful; for the thunder of the French artillery actually made the earth to shake again; but though the earth shook, the single British howitzer was neither dismounted nor silenced; and though the artillerymen could not — perfectly exposed as they were — stand to their gun whilst the iron hail was striking thick and fast around, yet no sooner did the enemy's fire slacken for a moment than they sprang to their post, ready to return at least one shot for eighty. This extraordinary combat lasted from seven o'clock in the morning till near twelve at noon, when the French ship—having had forty-one men killed or wounded, her commander being in the list of the latter, and having, besides, sustained serious damage in her hull and rigging—returned to Antwerp without effecting anything whatever. The howitzer was not dismounted; the fort was not injured—there being, in fact, nothing to injure; and the British had only one man killed and two wounded.”

In a pamphlet like the present it is impossible to say all that might, and perhaps should, be said on this subject; but I feel certain I could easily prove to the satisfaction of any one, that one gun behind an earthen rampart is equal to at least two guns in casemates; and as a defence against shipping, my own conviction is, that the proportion is at least as one to four. To take an example from the fortifications of Portsmouth. If the masonry of the Point Battery were removed, and an earthen battery of four guns substituted, it would be a more effectual defence of the port than are the twelve guns now placed there; and if ten or twelve guns behind an earthen rampart were substituted, the effect of the battery would be increased at least four-

fold, and with the further advantage that the earthen battery would not cost 2000*l.*, while I should be sorry to contract to build the masonry one for 20,000*l.*

Before leaving this part of the subject there is one other objection to open batteries, which it is necessary to notice. It is said, that it is necessary to casemate them to protect them from the musketry fire of ships: were this so, a slight roof of two thicknesses of oak-plank, with a sheet of iron between, would be as effectual as 3 feet of masonry; but if any one will take the trouble to draw a diagram, he may, without having recourse to trigonometry, find out, that, supposing the floor of the battery to be absolutely on the level of the line of floatation of the ship, an 8-foot parapet would protect the men in the battery from a deck 20 feet above the water, even if the vessel could approach within 100 feet of it, and at the distance of her own length it would protect them from the fire of a deck 30 feet above the line of floatation; but as no battery ever was placed so low as this, this is an extreme case, and every foot it is raised increases the protection in a geometric ratio. It is very, very seldom indeed that a ship can get within 60 yards of the crest of a parapet; and as for the fire from the tops of a vessel going 10 knots an hour, it may very well be laughed at, or at all events a few riflemen behind the parapet will make much better practice against the men in the tops than they can make against the men in the battery.

From all this it is easy to see that the first principle which ought to guide an engineer in designing batteries against shipping is, that no masonry should be used, except in places where it can be completely covered up from the fire of shipping. A second is, that the guns should be as widely spaced as possible. In the Blockhouse, and generally in casemates, they are spaced 25 feet apart from centre to centre, because the enormous expense of masonry does not admit of wide extension; so that a ship's broadside covers eight of them at once: if 30 feet apart, it only covers six or seven; if 40 feet, five; and if 50 feet apart, from three to four; an immense advantage, besides the freedom from interference, &c., which it gives.

A third principle is, that the axes of the gun should always be as nearly as possible at right angles to the course the vessel must take, and of course have as great an amount of lateral range as can conveniently be obtained.

Bearing these principles in mind, the next point is to try and ascertain if any works can be erected which will render the successful attack of Portsmouth Harbour from the sea a virtual impossibility.

On looking at the map, the first thing which strikes the engineer is the singularly favourable disposition of the ground: if the harbour opened at right angles to a plain flat shore the problem would be difficult; if the sides of the entrance were parallel there would be danger of one battery firing into the other; but here the shore from Southsea to the mouth of the harbour is at right angles to the ground from thence to Fort Monkton, and just of that extent that the whole may be covered by a cross-fire of the most tremendous description. I am not aware of any harbour in the world so favourably situated for defence as this.

The mode in which I would propose to take advantage of this would be as follows:—First, I would erect a battery between Southsea Castle and the Counterguard of the King's Bastion in the rear of the present road 4000 feet long: I would mount on it 100 guns; one-third of them, at the end next the town, where the range is necessarily limited, might be 32-pounders of 40 cwt.; one-third in the centre—heavy 8 or 10 inch guns, for shell or shot; the remainder, heavy 32-pounders of 56 cwt.

Beyond these, to the left of the Castle, I would place a similar battery looking south-west, of 40 guns of the heaviest calibre and longest range.

In addition to these I would raise a bank, between Blockhouse Fort and Haslar Hospital, on which I would put forty guns of long range, and between Haslar and Fort Monkton another battery of twenty guns—altogether two hundred guns, spaced 40 feet apart from centre to centre.

The extent of this armament, as applied to shore-defences, is startling, though we think nothing of building and fitting out two line-of-battle ships bearing a greater number of guns than this; on looking, however, a little more closely at it, it is not so very frightful after all.

First, with regard to guns:—In 1848 the government price of guns was 12*l.* 10*s.* per ton, and since then has, I believe, been reduced; but letting it stand at this, the average weight of the guns wanted would be about 50 cwt. each, or say 32*l.* 5*s.* per gun, or in round numbers 35*l.*



Traversing carriages complete cost, according to the 'Aide Mémoire' (vol. i. p. 213), 50*l.*; and for a number, they should be considerably less; adding 15*l.* for tramways, fittings, &c., and other expenses, it makes up 100*l.* per gun, or 20,000*l.* for the whole; but as they all would not require traversing-carriages, nor the expense be so great, that sum should leave a large margin for expense of magazines and other necessary accompaniments.

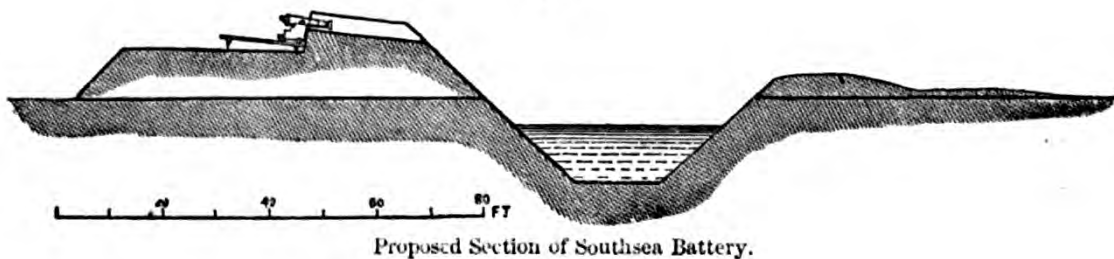
Secondly, with regard to the ramparts on which they are to be placed. This is not so easily estimated without accurate surveys and more intimate knowledge of the nature of the soil and other local peculiarities than I can pretend to. The following may be considered as an approximation:—

All that would be required in the Priest's Field, between Fort Monkton and Haslar barracks, would be a parapet 6 feet high, over which the guns would fire: no ship being able to approach within 1000 yards of them, and Fort Monkton forming an admirable traverse, further cover would be useless. The expense of this could not exceed a few hundreds.

To dredge up sufficient mud from the Haslar Lake to make a mound sufficient to carry forty guns ought to be an easy and cheap operation, for which from 4000*l.* to 5000*l.* ought amply to suffice.

The expense of the great battery between Southsea Castle and

*Fig. 1.*



the town will depend mainly on how it is formed. If according to the section here given, it will require about 80 cubic yards per yard lineal, or say 106,000 cubic yards of earth—the whole of which it is, perhaps, not expedient to take out of the ditch, but the whole of the rear and the heartings of the rampart may be formed of shingles, of which there is an unlimited supply on the beach. Taking the expense at the extreme price of 1*s.* per yard, it would be a little more than 5000*l.*; and half that sum

should suffice for the forty-gun battery to the left of Southsea Castle, or say in round numbers 10,000*l.* for the two; and as an extreme limit, say 20,000*l.* for earthworks altogether.

To remodel Southsea Castle, so as to be a serviceable barrack for 200 men, and general store and depôt for the whole 140 guns of these batteries, might require from 10,000*l.* to 20,000*l.* All its guns looking seaward would be dismounted, but it would be so arranged as to be a powerful flanking defence to both batteries, and generally to serve as a keep and signal station for the whole of this portion of the defences. The whole expense, therefore, with these additional 200 guns, ought not to exceed 50,000*l.*, or at the outside 60,000*l.* Guns, however, are of no use without men to work them, and it would be a very serious objection to this proposal if an additional force had to be raised for the purpose.

Fortunately there exists in the Dockyard battalion a body of men most admirably adapted to the purpose, but of very little use for any other exigency of war.

To drill and employ them as infantry soldiers is not only expensive—inasmuch as it is employing men at 4*s.* or 5*s.* a day to do the work that is better done by those who earn 1*s.* per diem—but it is also impolitic, as the very time at which these men would be employed campaigning is just the time when their services would be most required in the Dockyard, either fitting out new vessels, or repairing those that come in disabled from the wars; and it is then far easier to get a dozen soldiers than one thoroughly educated dockyard artificer: and with all due respect to so intelligent a body of men, they would make but very indifferent soldiers if led by their officers into the open field against such thoroughly educated troops as would be opposed to them.

On the other hand, the complete education of the eye and hand which these men have received from their boyhood makes them admirable artillerymen, almost without instruction; so much so, indeed, that they have astonished experienced officers by the precision with which they fire, even the first time they ever handle a linstock.

The Portsmouth battalion consists of upwards of 2000 men, of whom not more than one-fourth or one-third are now drilled as artillerymen—but in the course of one spring they might all



be made so—and this should be their only drill, for, even if ever called upon to defend the ramparts of the town—the only other use to which such a force is applicable—it is only as artillerymen that they could be of service.

As experience has, however, proved them to be first-class artillerymen, all that is wanted is, that they should be told off to particular guns, or divisions of guns, and that part at least of their drill should be to muster and man these guns at a particular signal—the south battery being the one at which they might practise firing at targets, at the others mere manœuvring or firing blank-cartridge. Assuming this done—if we have half an hour's warning of the approach of the enemy—and the sentries in Southsea Castle would see them fully that time before they came within range—if the men were in the dockyard, they might easily be all at their posts in from twenty minutes to half an hour, and, even if at home, almost none of them reside beyond half an hour's walk of the batteries, most of them less; but we do not want them all—the battery in Priest's Field would not require to be manned, being too distant to be of service against such an attack. There is the garrison of Southsea Castle, 200 men, and I presume 100 in Blockhouse Fort, who would be too glad to exchange their own casemated abattoir for the secure and airy battery outside; so that a thousand men from the battalion would suffice, and the remainder might remain in reserve.

Let us now look at the effect this would have on the defence of the port.

Before a vessel could pass between the Spit and Boyne Buoys, she is in full range of the 40-gun battery, whence the men may practise upon her as coolly as at a review, as she could only answer from her starboard bridle-ports with a fire too insignificant to be thought of: every gun might give her three rounds; and certainly that ought to make some ugly holes in her; but suppose she passes this, and as she comes in front of the 100-gun battery let us pause a moment to estimate the relative value of her fire as compared with that of the battery. If she wishes to see what she is doing, she must only fire from one tier of guns—and then her own smoke will blind her; but even without this, anything like precision of firing is impossible in a vessel moving at the rate of 10 knots. Those who have witnessed the firing from the *Excellent* know how difficult it is to hit a target 6 feet

square at 600 yards, with all the appliances they have, in a perfectly still vessel in smooth water ; but here the target is only a gun pointed directly at the ship, and which, with its embrasure, cannot be said to present a target of 2 feet square ; anything therefore like an attempt to hit a particular gun is out of the question ; broadside or salvo firing is all that can be attempted, and its effects are easily calculated. The guns being spaced 40 feet apart, and presenting only 2 feet front—supposing the elevation of the ship's guns to be perfect—one shot in twenty would take effect ; but as the elevation is as likely to be 10 feet above or below, as correct, only one in ten of those whose direction was true would hit the target, or, in other words, if one or two shots out of a broadside of fifty took effect, the ship would be as lucky as she has any reason to expect ; it is true she might knock away a good deal of earth and make considerable confusion about one or two guns ; but though this might be serious in a small battery, it is immaterial when there are so many. On the other hand, a ship presents a target 200 feet long by 30 feet high, which it is almost impossible to miss. Every gun has of course a quoin giving the elevations of the water-line of a ship at 200, 400, and 600 yards ; but even if fired too low the balls ricochet and hit the vessel ; if too high, they equally hit the mark, and if a shot takes her between wind and water it is nearly fatal. Even, too, if she envelops herself in smoke, her mainmast too surely points out her centre and marks her for destruction. In fact, while it is a chance if more than one shot in a hundred takes effect on the battery, ninety-nine in a hundred do fatal execution on the ship. It was the knowledge of this fact that made Napoleon in his instructions to the Marine say, “ Il résulte de l'expérience qu'une batterie de quatre pièces des gros calibres a l'avantage sur un vaisseau de 120 canons.” This is probably somewhat exaggerated, and applies to a vessel stopping to engage a battery ; there is still, however, a considerable residue of truth in it. Besides this we must remember that one shot striking her stern-frame may prevent her steering, or jam her screw ; and with all these chances against her, can we presume that she can stagger past the 100-gun battery ? Even if she does, however, she is not out of danger ; there is still the 9-gun battery on the long curtain which should be preserved, and the 40-gun battery to the right of the Blockhouse, which her guns never can see, but

which should practise on her with fatal effect. My own conviction is that nothing which human hands ever formed of wood and iron could pass through such an ordeal ; and even if she did, it is not, as in the former case, that she has made the way smooth for her consorts. Out of 190 guns she may have dismounted or damaged two or three, but there still remain sufficient to sink any vessel now afloat.

I would now put the same question as before—Is there any admiral or officer who would volunteer to take his ship past these batteries ? and if there is, is there any Government or Admiralty who would sanction such an experiment ? My conviction is that there is not : and yet this virtual impregnability against what is now a feasible mode of attack may be obtained in the first instance, and maintained ever afterwards, for less expense than would be required to build a single frigate and retain her in commission.

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## SECTION III.

## LAND DEFENCES.

THE land defences of Portsmouth are the work of the last two centuries, having been commenced under the Stuarts, and continued at intervals to the present time, and, as might be expected from works carried on through so long a period, and under such varying circumstances, they show great variety of trace and design, and very little of that unity which is the first essential of a good fortress, the greatest merit of which is that it should be equally strong in all parts, for, of course, if this is not the case, the enemy chooses the weakest, and the strength of the rest is absolutely useless.

As may be seen from the plan accompanying this, the works consist of three separate and distinct lines of fortification, the oldest being those of Portsmouth, the trace of which belongs to the age of Charles II. and William III., though somewhat improved since their days; those of Portsea are of the time of George III., and very far superior both in trace and profile; while those of Gosport are little better than field-works, consisting merely of an earthen rampart, unrevêted, and without outworks, the only defence against even an attack "de vive force" being a shallow cunette of very miserable dimensions.

Estimating the strength of these lines, as is usual with engineers, by the number of days they could resist a siege "en règle," from the first opening of the trenches till the time when the besieger could certainly calculate on lodging himself on the top of the breach, the Portsmouth lines may be estimated as capable of resisting from sixteen to twenty days, those of Portsea from twenty to twenty-four, and those of Gosport ten or twelve—that is, supposing everything to be clear in front, and everything as favourable for the defender as for the besieger. This, however, is unfortunately far from being the case here, for the land in



front of the lines not belonging to the Government has been built over all round, so that an enemy could approach on all sides, under cover, to the very foot of the glacis. This, on the Portsmouth side, would abridge the labour of the besieger probably four or five days; for though it may be said that the houses could be shot down from the ramparts, still their rubbish would afford the required cover and supply timber for battery platforms, blindages, &c., which would facilitate matters amazingly; and on the Gosport side it is fatal, for an enemy finding cover within easy musket range of works liable to be carried by a "coup de main" would probably settle the matter in four-and-twenty hours, and even if it was deemed necessary to proceed with more caution six or seven days ought to suffice to insure success against these lines.

Another defect, arising from the difference of times at which these lines were erected, is that all three are placed exactly where they should not be, so that, if they could change places with one another, the strength of the whole would *ipso facto* be nearly doubled. On the Portsmouth side, for instance, if an enemy were to besiege and take the stronger lines of Portsea, it is true he would gain possession of the dockyard, but he could not hold it, and would be obliged to commence a second siege of Portsmouth before he could either retain that or gain possession of the harbour; if, however, he carried the weaker lines of Portsmouth, the lines of Portsea are taken in reverse, and untenable, so that he gains possession of the whole at once by a far easier process. The fact however is, that the vulnerable point of the position is Gosport, and there the fortifications are incomparably the weakest, and, being taken, the others fall at once. In itself Portsea Island is singularly inaccessible; its south face, which is apparently the most exposed, is covered by sand-banks, which prevent the approach of vessels within three or four miles, and anything like a breeze would prevent the possibility of a landing, while in the calmest weather it is a very unfavourable spot, to say the least of it, for such a purpose, and the defenders can find plenty of cover close to the shore, and a safe retreat to their lines if beaten. The east side is covered by Langston Harbour, whose entrance is sufficiently protected by its bar and Fort Cumberland; the north by a swamp and the Postbridge lines, which could easily be made very formidable; and the west

by the harbour: so that, in reality, the fortification of the town looks almost like a work of supererogation.

But the case is very different on the Gosport side. A fleet sufficiently powerful to subdue any resistance it might find from ships at Spithead may take up any position it chooses between Cowes and Ryde, without one single gun being brought to bear on it, either in taking up its position or when at anchor; and may then, with the certainty of smooth water, land its troops anywhere it pleases between Stokes Bay and Southampton Water.

It is true Government have lately erected in Stokes Bay two works, bearing I believe eleven guns each, which would be formidable either to ships coming within their range or to troops landing there; ships, however, need not come within 4000 yards of them, and this is, I conceive, not the place where any general would attempt to land troops, being much too near the city for that purpose; should such be attempted the commander of even a weak garrison would not hesitate to send out parties to interrupt the landing, as either through Fort Monkton or Gosport they have a secure retreat within a mile or so of the scene of action. But if the landing were attempted ten or twelve miles off, a commander would require to have a very strong and powerful garrison indeed to justify him in detaching troops to such a distance to oppose the landing of twenty or thirty thousand men, who would probably spread themselves over ten or twelve miles of coast, and might cut off any detachment of the sort long before they could regain their cover.

Once landed, the first operation I conceive would be to occupy Fareham and throw up a series of lines from the harbour to the Solent, probably at Hill-Head Haven: this done, and their left secure, their front being covered by the harbour, their rear by the sea and their fleet, they are at liberty to pursue operations against Gosport at leisure. As I said before, I feel convinced that such troops as the Chasseurs de Vincennes would carry the place at a rush, and, if there was no such hurry, by siege in a week or ten days. Once in possession of Gosport, the dockyard and both towns are perfectly open; the harbour, and all that it contains, may be destroyed; the Blockhouse fort, having only a tall brick-wall to oppose, may easily be rendered untenable, and the other town-batteries looking towards the outer harbour enfi-

laded or destroyed, so that the road is open for the fleet or its boats to enter and take possession when it suits their convenience, but there would be no hurry ; as a defensive element Portsmouth would be destroyed, and its actual possession to an enemy carefully entrenched on the Gosport peninsula of singularly little importance.

Even supposing, however, that these lines were strengthened to any conceivable extent, there is another mode of attack which they would not obviate, and which would, especially in this country, be probably quicker and more effectual than the approaches of a regular siege. By seizing the suburbs which surround the three towns the enemy could at once establish mortar batteries within easy range, so as to cover the whole town with a shower of shells ; and as there is not even bomb-proof cover for the garrison, much less for the inhabitants, and the dockyard and town are composed of singularly combustible materials, it would be short work to destroy the whole.

Would any English commander dare to expose so many innocent lives to certain destruction ? and would the sense of humanity in this country justify him in holding out under such circumstances, sacrificing so many thousands of lives only to avert an inevitable doom for ten days or a fortnight ? Besides that the burning of the town and dockyard would considerably facilitate the operations of the siege by distracting the attention of the garrison and depriving them of their shelter, its chance of procuring an instant surrender is so great that I feel convinced it is the expedient that would be resorted to, and successfully, if I am not very much mistaken.

Government are, meanwhile, so convinced of the weakness of Gosport and the necessity of strengthening it, that they are erecting, or propose to erect, a series of detached works across the isthmus, from somewhere about Hardway to Stokes Bay : this however will, I fear, only prove an indifferent palliation of an imminent danger, as the locality is singularly unsuited for such a mode of defence, and the means available do not seem sufficient to remedy the inherent defects of the system.

Without entering here on the much-mooted question of the value or otherwise of detached works, there are one or two principles which will, I fancy, be conceded by all.

Detached works ought either to be complete citadels, capable



of containing garrisons large enough to act on an enemy and prevent his leaving them in his rear without danger to his movements, or they ought to be sufficiently near to afford effectual support to one another, and then must either be supported by an army in their rear, or by some continuous *enceinte*, at such a distance as to afford them effectual support; and as a corollary of this, all the works, either detached or continuous, must have clear space around them and see one another. The works now proposed unfortunately meet none of these conditions; indeed it is evident that the funds at the disposal of the executive are insufficient for any effectual remedy, and the present can only be regarded as a temporary expedient to do something, however small it may be.

It is proposed to occupy the country extending from Hardway or Elson's Hard to Stokes Bay, extending to a length of 4400 yards, by three principal works, between which smaller ones may afterwards be fitted in. The direction in the first place is bad, for the right is not sufficiently advanced to protect the dockyard and harbour, and the left is thrown so far forward as to be quite out of reach of the works in the rear. But a worse defect is, that the whole country between the proposed works and Gosport is occupied by villages and gardens, &c., so that the line is absolutely detached from its support, and the country between them is also cut up by roads, covered with trees and farmhouses, and singularly unsuited to this mode of defence. If, as at Torres Vedras, there was an army behind them nearly equal to the attacking party, they would no doubt be a most valuable auxiliary defence; but as the besiegers will probably outnumber the defenders in the ratio of three or four to one, such works, 1200 or 1500 yards apart, can never prevent an enemy running parallel trenches between them, cutting them off from support, getting into their rear, and then easily overpowering their weak, detached garrisons. Unless, indeed, detached works are so grouped together as to act as one body, they only perform for a garrison the bad service that a number of fortifications does for an army, parcelling it all into small bodies, which are first easily masked and then as easily overpowered.

But it is perhaps needless criticising these, as I do not suppose that even their designers fancy they are sufficient for the



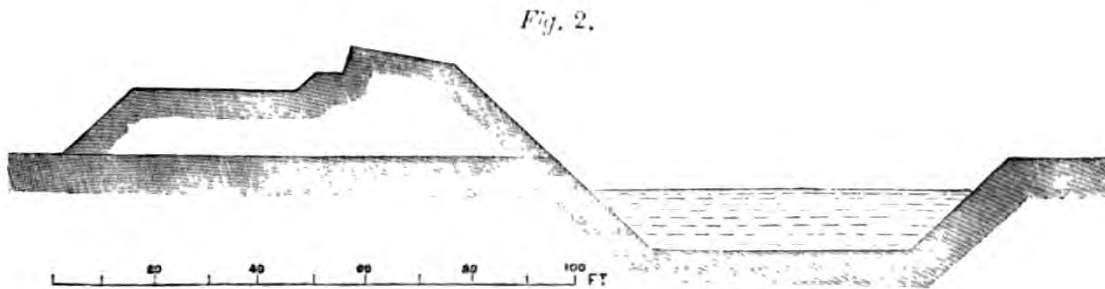
purpose, though in certain contingencies they may be of service; the worst of it is, that, being erected according to the expensive principles of the system now in vogue, they will probably cost more than a far more effectual fortification correctly constructed on improved principles, so that it is only doing what must be undone again, and that shortly.

To prevent misconception, I may as well state, before proceeding further, that I have not seen any official plan of the proposed works at Gosport. I speak of them as I have heard them described by those intimately acquainted with their details, from the knowledge I have acquired of them myself on the ground, and from the specimen already erected in Stokes Bay, which sufficiently explains the system according to which they are to be erected. I may, however, be mistaken in some points, but it is of little consequence; they avowedly will not suffice; so I shall at once proceed to explain the means by which I propose to meet this most important difficulty. To make it as clear as possible I shall begin to describe the proposed additional defences at the Blockhouse fort, and take them in succession till we come round to Priddy's Hard.

Between the Blockhouse and Fort Monkton is a front of about a mile, on which I have already proposed to place sixty guns in addition to those now mounted in the forts, which is far more than sufficient, with the shoal water in front, to prevent any ship anchoring within a mile of it, or attempting to return its fire, and more than sufficient to prevent boats from attempting a landing, for, in addition to its direct fire, the town batteries flank the whole space: it may therefore be considered as perfectly secure; but if more were wanted, a palisade to prevent boats landing, or a flanking caponiere opposite Haslar's Hospital, would do it effectually, but it is certainly not requisite.

Between Fort Monkton and the Gomer Ponds in Stokes Bay is about one mile and a half, on which it might be possible for a fleet anchored at Spithead to land troops in boats and get into the rear of the lines: this would be both a dangerous and difficult operation, still it is possible and must be prevented. Fortunately, for nearly the whole distance there is a tract of low marshy land, in which I propose to dig a military canal 80 to 100 feet wide, throwing up the earth in a rampart in the

rear, something in section like fig. 2, and in plan like what is



Section of Canal and Rampart.

shown on the map: both, however, may be modified to a considerable extent on more mature deliberation. The only guns required here would be a sufficient number to flank the ditch effectually: if this is done, no troops landing from boats could possibly pass the ditch without getting under cover, and then erecting a pontoon bridge, or something of the sort, which on an open shingly beach like this is impossible; and if anything of the sort were attempted, almost any number of troops might be destroyed either by musketry or artillery fire from the ramparts. There may be other, and perhaps better modes of effecting this object, but, at all events, the defence is so easy, that it may be accomplished at a very small expense, and this flank rendered perfectly secure against any force that may be brought to bear upon it.

We now come to the greatest and most important work required for the defence of Portsmouth, and, consequently, the one by which the merits of the system may be best tested; it will therefore be essential to describe it somewhat in detail.

The shortest line that can be drawn across the isthmus on which Gosport stands is two miles and a half—I have adopted one three miles long, because, in the first place, it is necessary to carry the right well forward to protect the harbour and dock-yard from shot and shells, and also because the ground in the front is more open, less expensive to purchase, and altogether better suited for defence than any position that can be occupied more in the rear. Assuming, therefore, Stokes Bay and Frater's Point as the true positions on which the right and left of the lines should rest, I have drawn the ramparts with a two-mile radius from the Clarence Victualling Yard; and adding 600 yards in front of this as the nearest point on which an enemy could

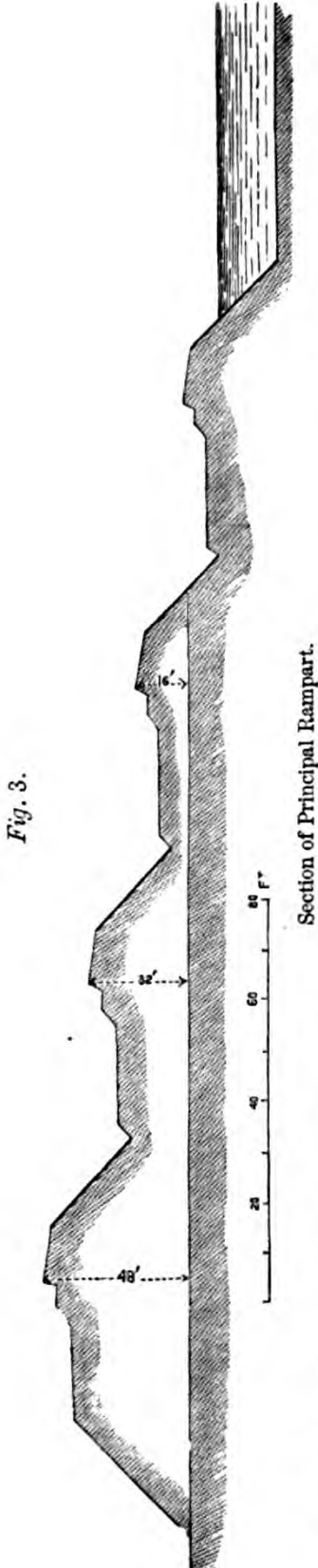
take up a position, every part of the town and harbour may be considered as perfectly safe from bombardment.

The outline of the works so described is extremely simple ; it consists of a ditch, nowhere less than 200 feet in width, nor having less than 15 feet depth of water. The dimensions would, of course, vary with the level of the country or the quantity of earth required for the rampart, but these should, I fancy, be about the minimum dimensions.

Behind this the earth taken from the ditch is thrown up in a rampart of the general form of that shown in the section (fig. 3), showing three tiers of ramparts, about 90 feet in width, and rising 16 feet the one above the other. A fourth rampart is excavated in front, the top of whose crest is on a level with the line of the country, so that it is not seen by the besieger till he has occupied the opposite side of the ditch.

This lowest rampart is bent forward, so as to form bastionets or caponieres capable of mounting 8 or 10 guns on each flank, and at a distance of about 600 yards from one another.

The second and third ramparts might, if necessary, be deflected in the same manner, and the number of guns doubled or trebled in consequence, but such would be a needless waste of means—all these bastions are required for, being to protect, by a strong flanking fire, any attempt to carry the place by a “ coup de main”—if such a thing were possible. At all events a smaller number of men could resist such an attempt from these bastions than could do so by direct fire from the ramparts, but the real defence must always depend



on direct fire, and that is abundantly supplied by the ramparts in the rear, to which a fourth rampart might be added if necessary, and should be in smaller works, as I have shown in my treatise on the subject.

Beyond the ditch is a covered way, sunk 8 or 10 feet below the level of the country and of curvilinear form, so as to prevent any possibility of enfilade from an enemy even if lodged on the edge of the ditch. In front of the bastion it is covered by a glacis, so as to prevent the bastions being seen or enfiladed under any circumstances, which, however, would not be easy, as the guns on them are further protected by a covering mass on the point fully sufficient for the purpose.

Such is the simple outline of the works proposed, which are so simple that any man, whether military or not, can comprehend them and their mode of defence; in principle it is this—that, possessing 12 miles of ramparts, they can mount more than 3000 guns, while on the other hand, even if an enemy had as many, and were to make his whole parallel from sea to sea into one great battery, he could not bring 800 guns to bear against them. Such a development of force, however, is not contemplated on either side: but of this more hereafter.

The next consideration is the expense of these works, which, though it is impossible to calculate exactly without minute surveys, may yet be approximated sufficiently near for our purpose. On the most liberal allowance the works will occupy 300 yards from rear to front, and, being three miles in length, will cover less than 350 acres of land. None of the land over which the works would pass is worth 3*l.* per acre, and a great deal of it is waste and absolutely worthless; so that, putting it at 100*l.* per acre—more by far than should be given—this item will amount to 35,000*l.*

Not one house or farm-building would be required to be pulled down over the whole of the surface, except at Stokes Bay, where three large houses have lately been erected on the ground that seems most favourable for the purpose. Being built on the very edge of a pestiferous swamp, they must, I fancy, be found so unhealthy that their owners will soon be glad to get rid of them—but Government cannot wait for that; and if their owners are not willing to part with them, there would be no difficulty in throwing the left of the line 100 yards further



forward, so as to leave the swamp in the rear instead of filling it up, or of adopting some other mode of effecting this, which would not be difficult, as the land there is absolutely worthless, and there is abundance of room for works of any form and to any extent; even the new batteries in Stokes Bay, slightly modified and enclosed, would help here. It being a difficulty, however, I put down 20,000*l.* to get over it, though less, I am convinced, would suffice.

In my work on Fortification I put down the price of such earthworks as those at 6*d.* per cubic yard, for reasons there detailed, a price which is confirmed by the table at foot \* which an eminent engineer allowed me to copy from a large contract for canal-work which he had just completed. It is the schedule of extras, and therefore considerably above the price at which the gross contract was taken, as it is on these extras and deviations that the contractor always hopes for a profit to make up to some extent for the low figure at which he places the whole.

The distance of the centres of gravity of the ditch and rampart being about 400 feet, and the ground generally of the most favourable description for excavation, it is evident that these prices give just about 6*d.* per yard; and considering that they are for extras, there can, I think, be little doubt but that at this price a contract could be obtained for the whole.

The section of the rampart being about 750 cubic yards per yard lineal, the cubic contents of the whole are about 4,000,000

	Per Floor.	Per Yard.	Average.
* To Excavating and Embanking :—			
1. For silt or loose clay, per floor of 400 cubic feet	s. d.	d.	d.
2. If hard clay or gravel . . . . .	3 2	2·536	} 2·95
	4 0	3·24	
Excavating and filling into wheelbarrows and wheeling 20 yards :—			
3. If soft clay or silt . . . . .	4 7	3·71	} 4·045
4. If gravel or hard clay . . . . .	5 5	4·38	
5. Wheeling, per stage of 20 yards . . . . .	1 8	1·35	
Excavating and filling carts and carting, per 100 yards :—			
6. For silt or loose clay . . . . .	7 0	5·67	} 6
7. If gravel or hard clay . . . . .	7 10	6·34	
8. Carting, per 100 yards additional . . . . .	2 6	2	
9. Carting, per furlong . . . . .	4 3	3·44	

of cubic yards, and the price of the whole consequently would be 100,000*l.*, instead of 800,000*l.* or 900,000*l.*, which it would require, at least, if fortified on Cormontaigne's principle.

Besides this, there would be required two covered passages through the two rear ramparts for roads, one for the railway, and say five for military purposes : these I put at 2000*l.* each ; and three permanent wooden bridges, and two or three slighter ones, would take say 10,000*l.* more ; and allowing 20,000*l.* for extras, the whole might, I am convinced, be easily executed for 200,000*l.*, and with care and economy for considerably less.

These works might be strengthened, if it were deemed expedient, either along their whole face or on any point supposed to be particularly open to attack, by semicircular bastions in front, with caponieres between, to defend their salients, such as I have drawn in front of part of the Gosport lines—giving the attacking party two ditches to cross instead of one, and the heavy flanking fire such works could bring would, no doubt, be serious impediments to a "coup de main ;" and those accustomed to judge by the rules of fortification now in vogue will, no doubt, think such works much stronger than the simple lines proposed. In certain circumstances they certainly would be so ; and if the design of the works were merely to protect the place against a brusqued attack, or to retard the progress of a siege, this would always be the case—these two being the only objects proposed by the modern systems ; but when the true object of every fortification is kept steadily in view, which is, or should be, to stop the enemy altogether, I believe the simpler lines will be always found the best.

In the first place, this bending of lines, and putting one before the other, necessarily diminishes the fire to the front, and prevents that unity of action which is the great secret of success.

In the next place, shelling and enfilading become possible—though difficult operations against isolated and confined works such as these ; and it is possible to conceive a besieger overwhelming one of these bastions with his fire, and destroying also the flank or flanks of those which should support it on either side ; and this done, he may cross the first ditch and lodge himself on the bastion. It is true he has not advanced much by so doing—he has still to cross the second, having first to subdue the fire of the rampart in its rear, and he has not gained much space for such

an operation ; nevertheless he has gained a cover and a vantage-ground immediately in front of the lines ; the garrison has been defeated, and lost ground, so that both morally and physically it is an advantage to him.

Another defect of such an arrangement is, it requires more skilled and better disciplined troops either to understand or defend it. Succour cannot be so easily brought to detached works—men cannot move so freely as along simple lines, nor move their guns or ammunition so readily : altogether it is getting into many of the defects of the old complicated and useless system instead of the simple and bold one proposed, which I feel certain, if tried, would be found by far the most efficacious.

Another objection would be the expense, which would be, including the price of land, nearly double that given above.

For these reasons I am far from recommending it—though I have thought it expedient to show it, that others might judge of its effects ; and I have not even on the plan thought it necessary to show the alterations that would be required in the rear rampart to prevent its being commanded. But as in its present form the whole scheme is little more than a suggestion, it is well to put it forward in as many ways as possible.

The garrison requisite to man these works depends wholly on the amount of force brought against them ; but as an “*armement de sûreté*,” 100 men in each bastionet would suffice, even with an enemy in front, to prevent any attempt to cross the ditch by rafts or pontoons, or anything except a permanent bridge. They never could be called upon to work the guns on both flanks at once ; so that seventy men would suffice for ten guns to the right or left ; and allowing a certain number to man the guns between each and other details, say 1000 men altogether, and they would be more than sufficient.

As for the rest ; if the enemy attempt to put 100 guns in battery, 200 must be manned on the ramparts by say 1400 men. If they put 150 guns into battery, which no army ever did or is likely to do, 250 guns and 1800 men may be required ; or, in round numbers, 3000 men could hold the ramparts against any army or any artillery that ever was brought into the field ; and of these certainly not one-third would require to be artillerymen, or even soldiers at all. Militiamen, dockyard artificers, coast-

guardsmen, and, better than these, men-of-war's men—all of whom are familiar with the handling of large guns—would be as efficient as the best drilled troops; and with works so simple, and defended only by one simple manœuvre of firing great guns, there can be no confusion or misunderstanding, as there must be in the complicated system now in vogue.

It now remains for some one to show how an enemy would attack such a fortification. Enfilade is wholly out of the question. Gun for gun, the defence is superior to the attack, from the height at which some of the guns are placed, and the grazing fire that can be obtained from others; from the consolidation of the parapets by time; and also from the fort being able to use guns of far heavier metal than can be brought to bear against it: so that if the fort could only reply with the same number of guns it must obtain the victory. But it can always command twice, or thrice, or four times the number, so that battering by artillery will not avail.

Shelling is equally out of the question. In the first place, the fort could easily command a greater number of mortars than the attacking party could bring, and so obtain the same superiority as before; but the garrison would hardly adopt so useless and expensive an expedient, as the fire of mortars must be nearly innocuous against such a work.

In the first place, no amount of shelling could destroy a mound 400 feet wide, 50 feet high, and consequently sloping towards the attack at an angle of only 12 degrees. It might, of course, damage the parapets, and destroy the beauty of their profiles; but, owing to their peculiar character, the works being accessible, under cover, both in front and rear, the earth so displaced could easily be replaced by the garrison even in daylight, and certainly without the least difficulty after dark. It is almost inconceivable, however, that any serious amount of damage could be done to such a mound by such a process.

The shells, however, it may be said, would dismount the artillery. This objection, too, is easily disposed of. A gun, with its carriage, occupies about 30 square feet; the space allotted to them on the ramparts is 1800 ( $90 \times 20$ ); so that it would require 60 shells to be thrown on the chance of hitting a gun once, if every embrasure were armed; if every other, 120; and so on. And even if the practice of shelling were so perfect as to



enable the enemy to hit a particular gun, all that would be required would be to mask the embrasures with a few faggots or an old rag, and the enemy could never tell where the guns were ; and even if a shell should hit a gun or its carriage, it by no means follows that it would be irretrievably damaged ; supposing it is, however, there are plenty more to supply its place, especially if the arsenal at Woolwich were removed to Portsmouth, which I presume it certainly would be if the latter place were fortified as proposed ; for no one would think of leaving the national stock of guns unprotected, when there is abundance of room for them in an impregnable fortress. If this were done, there would be 24,000 guns available ; and 100 mortars, throwing shells day and night incessantly for twelve months, would not destroy them all.

Throwing shells on to a rampart to kill the garrison is what has not yet been tried, and, when it is, will certainly fail. In the small confined works of modern fortresses, many men, it must be confessed, may be unable to escape their effects ; but when those on duty are dispersed over 350 acres of surface, and capable of moving right and left without interruption, the case is widely different. If the besiegers take to shelling a particular spot, the garrison have only to get out of the way, leaving a sentry or two to watch, and they can easily avoid the effects of the shells ; for there being absolutely no brickwork or resisting medium, the shells as they fall would bury themselves, and on exploding form a crater, which casts the fragments upwards, so that a man has only to throw himself on the ground, even close alongside, to avoid the effects.

An attack by rifles is another mode which suggests itself. The enemy, it may be said, working only at night, may sap up to the edge of the ditch,—and it would not be worth the garrison's while to try to prevent their doing so,—lodge themselves there, and then, by a powerful rifle fire, prevent the besieged loading and firing their guns, while they unmasked powerful batteries upon them. But rifles cannot be used in front of batteries which must reply with a low grazing fire, by which the riflemen would certainly be killed ; and either behind or between guns the smoke will prevent their seeing what they should be aiming at ; and by itself rifle fire can be of no use against 18-foot parapets and embrasures covered by mantlets.

A combined attack by mortar and artillery fire may, at first

sight, seem feasible. If, for instance, masked batteries of 100 guns and 100 mortars were suddenly to open on a given spot, the effect would be tremendous. That given spot, however, must be at least half a mile in extent and 400 feet wide ; and as it would be impossible to prepare for this without the besieged knowing something of what was going on, they must be prepared with at least 200 guns and 100 mortars to reply, which would make short work of the guns, and the mortars would then, as before, become comparatively useless.

It is difficult, however, to meet objections before they are made ; but as far as my own reading and knowledge go, or that of any one I have yet heard speak on the subject, I have no hesitation in asserting that no means used in sieges up to this hour, or invented or proposed, would enable an army, however strong, to get across such a ditch, and storm such ramparts.

Perhaps an officer unaccustomed to this mode of defence will realize it better if he will fancy himself ensconced with his troops in Kensington Palace, and ordered to march across the Serpentine towards London. Even supposing there are no defenders or guns on the opposite side, it is no easy matter to get troops, with their arms, ammunition, and clothes, across a deep piece of water 200 or 300 feet wide. He must have boats, pontoons, or be allowed to build a bridge. When it comes to this, he must fancy the bridges at either end converted into batteries of 10 guns each, sweeping the whole with a heavy cross fire ; and in front of him 100 or 200 guns, securely ensconced behind earthen parapets, and ready to open on him at a moment's warning. What would he do then ? Let some one explain the next manœuvre, for I cannot !

In smaller and more confined works it might be necessary to obviate part of the inconvenience experienced from vertical fire by covering a certain number of the guns with casemates, not of course with masonry fronts, but Haxo casemates, in which the earthen parapet and embrasure remain the same as on an open rampart, a vault only being thrown over the gun. When, however, such an extent of rampart can be obtained as is here available, this would be a useless precaution, and it would be cheaper to allow four or five guns to be destroyed than to erect one vault ; besides, the advantages of light and air are so great that I question if casemates would not be more prejudicial to the defence

than otherwise. The only place where they really might be of use is on the bastionet ; from the confined space there, the guns are more liable to annoyance from shells than in any other part, and it would be desirable to have a certain amount of bomb-proof barrack accommodation in front, to guard against surprise ; besides this there is no spot from which these guns can be counter-battered, so that they are only exposed to injury from mortar fire ; but, notwithstanding all this, I scarcely think it would be worth the expense to do this. The use of these projections is to defend the place before the regular attack is organized ; once that is done, it would be perhaps as well to withdraw the guns and arm the *fausse braie* with them, and trust to the more effectual direct fire for defence.

The only other work on this side remaining to be described is the return on the right to prevent the possibility of the lines being turned by the flank. This could only be done by troops marching in the mud at low water, or by boats ; the latter need hardly be feared, as the besiegers must either build their boats at Fareham or transport them overland to that place, both tedious and difficult operations, which would give the besieged plenty of time to prepare, and so prevent such a mode of attack, which is always a difficult and uncertain one, even under the most favourable circumstances.

The other mode of attack is nearly as difficult : it is only about 150 yards from Frater Point, and consequently from the covered way of the fortification, to deep water, and the enemy must pass this knee-deep in mud to get round, and under a musketry and artillery fire that should be able to stop them on the best marching ground ; however, to make it perfectly secure, I propose carrying a canal for about half a mile in the rear, and flanking it effectually, which would, I fancy, prevent any such manœuvre being thought of.

Having so fully described the works on the Gosport side, and explained their use, those proposed on Portsea Island may be dismissed with a very few words of explanation.

The principal work is a great battery to defend the entrance to the island from the north. In plan and section it is similar to that in front of Gosport, but, owing to the difficult nature of the



ground in its front, it need neither be so strong nor so carefully executed. The greater part of the ground it would occupy is a worthless swamp, part of it belonging to Government, and not one single house would be required to be removed. In extent it is about equal to one-half of that on the Gosport side, but from these circumstances would not cost nearly half as much—say 80,000*l.* Its garrison would also be half, or 1500 men, and, owing to the peculiarly favourable character of the ground in front, it would be more easily defensible: the greater part is a swamp with a tide-way running through it, and beyond that an open level for about 2000 yards, when the ground begins to slope upward, but so gradually as to cause no annoyance. On the left of this I would propose to erect a *flèche*, as shown in the plan, on the Tipnor peninsula, with two tiers of guns on its straight flank and three on the point; its use would be to prevent the flank being turned, either by the enemy taking possession of Horsea Island or by any other means. It is, however, by no means essential, as the peninsula is cut off by the canal in its rear, and its possession would hardly be an advantage to the enemy. It certainly, however, would be of use as covering its rear and protecting the ground in front, and, as the expense should not exceed 10,000*l.*, it would be well to have it.

I would also propose to spend, say 20,000*l.*, in converting Porchester Castle into a detached citadel of considerable strength, which that sum would suffice to effect. Even if the garrison of Portsmouth were so weak that it were determined not to detach any men to hold this place, its possession by the enemy would be of no use to him, but to the defenders might be important, being a *point d'appui* in the very middle of the lines of a blockading force, whence the garrison might sally on the rear of an army attacking either the Gosport or Portsea lines, and it would require an immense development of force on his part to neutralize the advantage the possession of this point would give to the garrison. It also secures the whole of the harbour from insult, for, though the town and dockyard are too distant to be injured by shot or shell from this point, the upper part of the harbour is not quite so safe, and it would be as well that that also should be protected.

The last work to be described is the military canal along the east side of the island; at first sight it may appear utterly useless,



and a work of supererogation. It is meant, however, to protect the place against some such manœuvre as the following:—Supposing an enemy blockading Portsmouth by sea and land were to order all the boats of the fleet and all those he could collect into Chichester Harbour, and then, passing them through Hayling Bridge, were to draw them up on the western beach of Hayling Island, out of reach of any guns from Portsea Island; what is there to prevent him from embarking 30,000 men in these boats an hour before high water, and throwing them on any point he pleases on the east side of Portsea Island? Such an operation is not only possible but easy, and no Governor of Portsmouth could feel comfortable with his flank open to such an attack, which it would require 30,000 men to resist, and the garrison defending the lines in front of Hulsea would be considerably demoralized by their rear being left so open.

All that is required to prevent this is a military canal, say 80 feet wide with 12 feet of water, and a rampart in the rear, so disposed as to flank it effectually, as shown in the map, and section No. 2. This would force the attacking party to leave their boats, form on land, and then attempt to cross this ditch under a heavy fire in front and flank, which they could not do.

The flanks should be armed and watched as soon as the place is invested, but need not be manned or the lines prepared for resistance till symptoms are shown of such an attack being contemplated, which could not be done either rapidly or secretly.

To make the south front perfectly secure this canal should be continued along it till it joins the 40-gun battery to the left of Southsea Castle; and it ought to return a mile or so behind the Tipnor flèche, to make that flank perfectly secure, as on the opposite side of the harbour.

With the canal in front of Alverstoke this would require about six and a half miles of canal, the amount of excavation being about 133 yards per yard lineal, and the total cubic contents of the rampart about 1,500,000 yards, which, at 4*d.* per yard, is 25,000*l.* The ground over which these canals pass is, with scarcely an exception, marsh or water, and of no value; but, putting 10,000*l.* for compensation, we have 35,000*l.* for this item.

To resume, therefore, the expenses of the whole project of defence—

	£.
The Harbour defences are put at . . . . .	60,000
The Gosport lines . . . . .	200,000
The Hilsea lines . . . . .	80,000
The Tipnor fêche . . . . .	10,000
Portchester Castle . . . . .	20,000
The military canals . . . . .	35,000
Total . . . . .	<u>£405,000</u>

—which I feel convinced is more than would be required for the purpose; while, on the other hand, were these works executed according to the bastion system, usually applied to such purposes, we must add at least a million to this sum, and then it would not be nearly so effectually done, and a garrison of 10,000 of the best and most experienced soldiers in the British army would not suffice to hold the place for a month if regularly besieged.

It will be observed that in this estimate I have put down nothing for artillery, and advisedly so; for as I presume the 24,000 guns would certainly be transferred from Woolwich to this place, 1000 or 1500 of them may as well lie on the ramparts as in the yards, where they would be quite as safe and as easily preserved, and be ready for use when wanted.

Another most important item has also been omitted—which is magazines and barracks. For this purpose, however, I have reserved 100,000*l.*, which is more than sufficient for the purpose. I would propose to enclose twenty acres of land on each of the three places marked B in the map—two behind the Gosport lines, and one behind those at Hilsea—and at each of them to raise commodious fire-proof (not bomb-proof) barracks for 1500 to 2000 men, and a large bomb-proof powder magazine, stores, artillery and engineer yards, &c. &c.: in short, complete military establishments. Having abundance of space and air, they would be infinitely preferable to the close, confined, and ill-built barracks in which the unfortunate troops are at present located.

But while putting down this expense I must, per contra, be allowed to take credit for the works at Portsmouth and Gosport, then no longer required, but occupying a large space of ground of the most valuable description.

To the Royal Dockyard alone it would be worth 100,000*l.* to

obtain the elbow-room the destruction of the Portsea lines would give them. There is a private company formed to make docks at Portsmouth, who would give a large sum for part of the ground now occupied by the fortifications of that town. The barracks, stores, and arsenals, which would be transferred to these spacious quarters in the country, would all realize large sums of money. The portion not wanted by Government, of the land now covered by the fortifications, if sold for building purposes, would fetch a very large sum. These items, altogether, ought, if properly managed, to realize a quarter of a million of money at the very least, which would reduce the expense to the country of the whole scheme to 250,000*l.*; but even allowing it to stand at the former figure of 400,000*l.*, I cannot conceive of any outlay that could be more profitably bestowed. Its effect, however, will be better understood when the next section is read, which is an attempt to explain the use this scheme of fortification would serve in the defence of this country from foreign invasion.

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## SECTION IV.

## INVASION OF ENGLAND.

HAVING now explained, as fully as is requisite at present, or as the limits of a pamphlet will admit of, the mode by which it is proposed to render Portsmouth a first-class fortress, it remains to show what the use of such a fortification would be, and what its bearing on this great question of the defence of Great Britain from foreign invasion. For this purpose it is necessary to consider first whence the danger is to arise, and how it is to come upon us.

The first inquiry is very easily answered—for France is the only country in the world at all likely to attack our shores. Austria and Prussia, even if they desired it, having no fleets, have no power to do it; and though Russia has a fleet, it is difficult to foresee the contingency that would induce her to employ it in a serious attempt to invade these shores. If unfortunately war were to break out between this country and America, she might insult our coasts, burn our arsenals, destroy the mercantile marine, in short, do us infinite injury, but a serious attempt to invade and take possession of this country is hardly to be dreaded from that quarter for a century at least, so that she too may be left out of consideration for the present; and we may confine our remarks to our nearest neighbour, and the one, alas! with whom it is of the most importance that we should be at peace and on terms of amity and good will, not only for our own sakes and for theirs, but for the sake of the great cause of intellectual freedom throughout the world. Notwithstanding this, however, there is every reason to apprehend an attack from that quarter, not only from the general feeling of the French people towards us, but because they know from experience that, without humbling us, it is impossible that they should be permanently successful in any wars they may be involved in with their other continental neighbours.



There is every reason also to fear that, in the event of the French finding a continental war inevitable, we should be the first people attacked. For if the war commenced in Belgium, on the Rhine, or in Lombardy, we should have time to prepare and develop our resources, so as to be as impregnable as before ; but, if taken unawares, a blow may be struck which would be nearly fatal to us.

These points have been so frequently discussed, and are so generally acquiesced in, that it does not seem necessary to enter on them in detail in this place. For the present purpose it will be sufficient to assume that, if there is no danger from France, there is none from any other quarter. On the other hand, it seems impossible to avoid the conviction that sooner or later causes of war must manifest themselves between us and France, or between France and the other continental powers ; and if once a general war breaks out, it is hardly possible but that we should be involved in it.

I think, too, that it will be generally admitted that a war with England would be the most popular in France of any she could be engaged in, and also the most politic, as the one most likely to ensure her success in other wars which must be assumed as the necessary consequence of the general peace of the world being once more seriously broken. For if England remains invulnerable, her power must in the end turn the scale against France ; but if she is removed from the contest, the chances of success for France are infinitely improved ; and when the voice of passion is thus seconded by the dictates of policy, it does appear that it would be madness to shut our eyes to the danger to which we are exposed.

At the same time it must be admitted that the activity which has for some years past prevailed in the French naval arsenals, and the efficiency which has resulted from this, have put that nation in a position to attempt the invasion of England with a far better prospect of success than she could have had at any recent period of her history.

We may feel pretty certain, therefore, that when war does again break out it will first break on our shores, and it behoves us carefully to examine how far we are prepared to resist the attack.

Among the expedients proposed for defence, one of the most

obvious, and naturally the most popular among military men, is to increase the regular army ; it is the most expensive, however, and also, I fear, the least efficient, inasmuch as it would entail a permanent expense on us, and require only a slight additional expense in the invader to neutralize it.

Taking, for instance, our available army at 50,000 men of all arms—or any other figure—let us suppose that it requires an invading army to be 100,000 strong to neutralize this and advance on the capital—if we increased our army by 10,000 men, it would only be necessary for the French to bring over and quarter on us 15,000 to 20,000 more soldiers, which they could easily spare, and the proposed addition would be of no avail to us, and so on for any greater number.

The militia is an excellent measure, as far as it goes, but utterly inefficient in a first campaign to meet the thoroughly disciplined troops of France : still the militiamen would suffice to hold all the garrison towns ; recruits from their ranks would at once swell the number of men in the regular regiments to a considerable extent, and, even if only armed with pickaxes and shovels, they might form a most efficient auxiliary to our defensive means.

Better, however, than either of these would be volunteer rifle corps—not to be drilled or act like soldiers, but merely as guerillas—never getting together in large bodies or fighting even skirmishes, but night or day, on duty or off duty, shooting every invader they can cover with their rifles. The nature of the country and the character of the people are singularly favourable to this mode of warfare ; and though they might not be able to defeat in battle even a small body of Frenchmen, 100,000 of them, if properly handled, might shoot down a large number of the invading force in the time they would take to march between the coast and London, which would come pretty nearly to the same thing in the end.

These expedients, however, should be after-thoughts : the true way to look at England is to consider her as a fortified city or country—the Channel being our fortification, and it has proved an impregnable one for the last 800 years, and with care may prove so still some time longer. It would be about as wise in the Governor of Paris, or any other fortified city, when threatened with attack, to throw up barricades in the streets and organize

means of defending these to the neglect of the real fortifications, as for us to think of internal defence, neglecting those that Nature has provided us with. The true policy in a governor of a fortified place is, of course, to put his ramparts and outworks in the best possible state of defence, and to hold these as long as they are tenable ; and it is only when they are forced, or on the point of being so, that it is necessary to turn attention to the internal struggle.

Looking therefore to the Channel as our true defence, it is obvious that our coast-line is too long to be efficiently armed or manned—for though this may be beneficially resorted to, to some extent, it is only by moveable batteries, or, in other words, by fleets, that the whole can be efficiently commanded and its defence made practicable. Fleets, however, consist not only of ships and men, but also of arsenals and dockyards—these latter being absolutely essential to the existence of the former ; and if our dockyards were in possession of the enemy and our fleets had no ports to which to resort for stores or to repair damages, and if we had no means of fitting out fresh ships, the finest fleet would soon melt away and be destroyed.

The truth of this proposition is fully admitted even on this side of the Channel ; inasmuch as the only fortifications we possess are those surrounding our dockyards. They are all more or less fortified, but not one of them sufficiently so—the works being generally ill contrived and badly placed, having been executed at a time when the art of fortification was neither studied nor understood in this country ; and being now left as they were, from the distaste the country feels, and always felt, to spending money on works of this class.—Plymouth is, perhaps, worse off than any, the lines there being singularly weak and insignificant, and surrounded by houses to even a greater extent than at Portsmouth ; but worse than this, they are placed on that side from which it would be difficult to attack the dockyard even without them, while both the dockyard and harbour are absolutely unprotected on the side from which an enemy would certainly choose to attack them. Its possession would be of little or no use to an invader ; but the possession either of Mount Edgecombe or Torpoint would enable him to burn and destroy everything and render it utterly useless to this country, which is all that he could wish or require.



So too, at Chatham, not one gun can be brought to bear on an enemy setting himself down in front of the dockyard, where at leisure he might burn and destroy everything, and close up the harbour against all ingress or egress. Sheerness is in the same predicament, and so is Woolwich; but as this last is not fortified at all, of course no blame rests there. It certainly is to be regretted that, while so much has been done to fortify our dockyards, it should have been done so badly, but it is only therefore the more imperative to remedy these defects and to make good the mistakes of former generations.

There can be no doubt also that the French are as fully aware of these facts as we are; and unless report is more false than usual, at the time of the differences regarding Tahiti and Mr. Pritchard's affair, it was fully determined on by Louis Philippe to make a dash at Portsmouth and take possession of it; and so feasible did the project appear, that since that time considerable activity has prevailed in strengthening the defences of the harbour mouth, and at considerable expense they have been made strong enough to stop a fleet of paddle-wheel steamers, which were all the French could then employ, and all consequently that these defences were designed to meet, but are utterly inadequate to protect the harbour against screw line-of-battle ships, which were not dreamt of at the time when the improvements were carried out.

The intention of the French king then was not seriously to attempt the permanent invasion of England, but simply to negotiate from the vantage-ground. An invasion now would probably involve, besides the occupation of Portsmouth, the destruction of the Plymouth and Medway dockyards; and if that were accomplished, our fleet has virtually ceased to exist. The Thames dockyards and Milford Haven, the only remaining ones, could not fit out an efficient fleet in six months; and even if the Medway yards were intact, the loss of Portsmouth and Plymouth, with their stores and arsenals, and the ships in ordinary and on the stocks in these yards, would paralyse the navy of England for a long time. Even the possession of Portsmouth alone by an invading force would, for defensive purposes, be equal to the loss of nearly half the British navy. In simple arithmetic I believe it contains between one-third and one-fourth of what constitutes our naval power, and the loss of its noble roadstead and harbour,



and the convenience it would afford to an invader to disembark troops and stores from Cherbourg, which is only eight hours' steaming from it, are so enormous as almost to settle the question of the practicability of an invasion or otherwise.

The mode of attack probably would be for the whole invading force to pass through Spithead, land 20,000 or 30,000 troops between Stokes Bay and Southampton Water, and, while these attacked by land, for the screw line-of-battle ships to force the harbour. As at present fortified Portsmouth could not resist such a combined attack for a single hour, and, once in possession of it, 20,000 Frenchmen would soon strengthen the existing Hulsea lines, and throw up a range of defences between Brown Down and the harbour, probably on the very ground I have marked out; and imperfect as these hurried works must necessarily be, 20,000 or 30,000 good troops would easily hold them against anything we could bring against them; and safely encamped in this position, and with their steamers bringing over 10,000 or 20,000 additional troops per diem, the invasion of England is accomplished; the holding it as a conquered country is another matter; but once firmly fixed on an impregnable position on our shores, the fall of the capital is inevitable.

Another mode of attack, far more written about in books, and more discussed in military circles, assumes the probability of our French throwing a large body of troops on shore in some of the open bays, and marching thence at once on London. It is further assumed that this can be done secretly, and partake of the nature of a surprise. Indeed, one officer, the Baron Meurice de Sellon, has written a book to prove that 150,000 men could be embarked in the harbours of Cherbourg and Brest, and land in England before we were aware of their intention, and could bring the declaration of war in their post-bag, and catch us perfectly unprepared. This absurdity is so well exposed by a writer in the 'United Service Magazine' for August in last year, that it is not worth while going over the ground again. The facts of the case seem to be pretty much as follows:—The French could easily, under pretence of a review or sham fight, get together five or six sail of the line, a certain number of steamers, embark 20,000 or 30,000 men in them, and throw them suddenly on shore on our coasts; but they could not assemble and embark 50,000, with the necessary complement

of horses, artillery, stores, &c., without our having at all events some days' warning, say a week. If the armament amounted to 100,000 men of all arms we should certainly be awakened to what was going on a fortnight or a month before all was ready for the descent; and at any figure beyond that it would come to a regular stand-up fight for the sovereignty of the Channel seas before anything like such an army and convoy would dare to show itself out of port; and we ought not to be beaten in such a struggle, first, because of our immensely superior naval resources, and, secondly, because all these resources are in the Channel and close at hand, while at least one-half of those of the French are necessarily in the Mediterranean, and too far from the scene of action to be immediately available.

Perhaps it will make this clearer if we take the medium category, and assume that the French determine on throwing 50,000 men on our shores. I, of course, leave out of the question at present the mode of attack by seizing or destroying the dockyards, and will assume they choose Pevensey Bay, or some other place on that coast, as the nearest to the capital, and also to their great arsenal at Cherbourg, which of course must form the base of their operations.

The first day they might land the 50,000 men, who might throw up round their encampment a trench sufficient to protect themselves from insult or surprise; the next day the fleet might proceed to land the artillery, the horses, and the stores; but neither one nor two days would suffice for such an operation on an open beach, and it would be very hard indeed if before that time such a fleet as we could muster would not be there to interrupt the regularity of their proceedings. Even if we had only three or four days' warning, that would suffice to get powder and coals on board, and to send out steamers to look out and know what was going on, and where the invaders were preparing to land; and as the very first element of a surprise is that the ships of the invading squadron shall be the fewest possible for the purpose, it would be hard indeed if, even supposing we could not defeat them, we could not at least disable some of them and force them into port to repair. At all events they might be drawn off, and allow the steamers to get among the transports, of which they would make short work; but, whether they did this or not, it is nearly certain that we could prevent further embarkations

and supplies ; and once the war was fairly engaged, if our arsenals were safe, I do not doubt, and I think few will, but that sooner or later we should resume the sovereignty of the Channel. If we could get home our Mediterranean fleet this of course would be easy, but that I fear is impossible, as, before the order was given to embark at Cherbourg, an order would be transmitted to Toulon to attack our fleet in those waters, and, even if unsuccessful, it would so cripple that fleet as to render its return to the Channel in time a matter of practical impossibility.

During all this time, however, we have left 50,000 men securely encamped on our shores, and ready to march on London. They are far too few to attempt a regular plan of campaign with any base for their operations, or even to protect their rear or provide for retreat in case of disaster. Their one chance is to place their baggage and stores in their centre and march on the capital in as compact a body as they can. The nature, however, of the country is singularly unfavourable to such an operation ; there is hardly any place where they could march across the country ; the main body must follow one of the principal roads, the right and left follow side ones, which are seldom or never parallel ; and to keep up communication between the different bodies, and anything like a battle array, would require great caution and very slow movements, while anything like resistance by cutting up the roads, defending the villages or woods, or attacking detached bodies, would so impede and confuse them that, though it might not stop the march, it certainly would delay it so much that it could not be performed in ten days or a fortnight. If, when they reached the suburbs, 100,000 special constables could be induced to put balls into their double-barrelled guns, and fight behind barricades in support of such troops as could be mustered, the matter would easily and speedily be settled. But let us assume that we are panic-stricken and give in, and allow these 50,000 men to take possession of the capital. The Court, the Government, and every one who can escape have fled to the North, thus they have only possession of a city containing 500,000 men capable of bearing arms, and have still got to conquer and hold a country with 5,000,000 of men in the prime of life ; and, admitting everything that every detractor of the British character may urge, at least 100,000 of these would volunteer to strike a blow for their country. In the mean while



the invader dare not detach 10,000, or even 5000 men for any purpose from his main body ; he dare not advance out of London to the North ; he can do nothing, in short, but hold the capital. He may plunder and he may threaten to burn the city and murder its inhabitants, but he will hardly execute any of these threats ; on the contrary, I fancy that 50,000 even of the best and bravest troops the world ever saw, would be particularly civil, if shut up without the possibility of retreat in a country with 5,000,000 of men of one sort or another, however unwarlike they may be assumed to be ; a little exasperation will make even cowards fight, and a slight disaster would be fatal to any troops so situated ; they must, in fact, eventually melt away, or be killed off, or lay down their arms, and it will be well for them if the people have no long scores to settle with them.

Even with 100,000 men the ultimate result must inevitably be the same, with the additional security that, if allowed time for preparation, we may be able to prevent the landing. In short, the whole operation is so hazardous, the success so uncertain, and the ultimate result so inevitable, that no prudent or skilful general would attempt it. It does not, however, follow from this that the contingency is impossible. If the army murmurs that their Emperor does nothing, and the people find their expectations disappointed of a second epoch as brilliant as that of the first Empire, it may be politic to raise the cry of " Vengeance for Waterloo !" which would at once make him the greatest and most popular man France ever knew. The fleet would glory in the opportunity—the army embark with enthusiasm,—and, supposing the worst came to the worst, what is the result ? 100,000 turbulent spirits the less in France—the pride of the army humbled—the fever of the nation abated by bloodletting—and all quiet for a while, and praying for even a stronger and a sterner despotism to wipe out this fresh stain ; and on the other hand, be the result what it may, a heavy blow has been struck at the prosperity and security of her hated enemy.

Although, therefore, the " open bay " mode of attacking England will never be resorted to while any other means are available, still it might and would be prudent to throw up earthen works in the more accessible spots. If these were mere batteries, open at the rear, or surrounded only by a ditch, the possession of them, if left unarmed and undefended, would be of



no more use to an invading force than the hills around them, and, if it were judged expedient to arm and defend them, they might seriously impede or prevent a landing.

Closed circular works of earth might also be expedient in some places, which, if not armed or defended, would be of almost as little use to the invader if they fell into his hands; for if in possession of the capital he would not want them, and unless he had the command of the sea he could not hold them against a blockade, though he might against a siege, while, on the other hand, they might enable a defending force to resist a landing confidently and long, and then, retiring to a secure retreat, hold their position to the no small annoyance of the attacking party.

These, however, are secondary considerations; for, turn and twist the question as we may, there is no denying the fact that the proximate and ultimate defence of England must mainly depend on the fleet, for no one, I fancy, will assert that, were we even situated where Belgium or Prussia is, our 50,000 soldiers, even backed by the militia, could resist the half-million of men France has under arms; nor is our military organization at all to be compared to hers; and if our defence is to be by the fleet, that is wholly and absolutely based on the possession and security of our arsenals. For I think it must be evident to every one that, if Portsmouth were in the possession of an enemy, nearly one-half of the defensive power of England by her fleet is gone at once; and if, in addition to this, the enemy were able to destroy Plymouth and the Medway dockyards, then the French fleet would, *ipso facto*, be superior to the English, and they could then maintain the supremacy in the Channel. And more than this: in possession of Portsmouth they could organize their means of attack at leisure, and, basing them firmly on Cherbourg and Portsmouth, could advance securely on the capital, and, even if eventually defeated, retreat as securely along that line, and return in safety with their plunder to their own country, having accomplished, if not all, at least the principal object for which such a campaign would be designed.

I have already shown how Portsmouth might be made practically impregnable by land and sea, and, if this were accomplished, more than half the task is performed; for not only would it secure to the fleet its most important harbour and arsenal, but

it would be most important in a military point of view. If fortified as proposed, it would be a place some 20 miles in circumference, and therefore extremely difficult to blockade by land and sea; and if this were not effectually done, there is nothing to prevent the remains of the defeated national army, and the seamen and marines of the destroyed fleet, as well as the militiamen, and every man who is willing to draw a trigger in his country's defence, from escaping into it, and within the ample space enclosed by its impregnable walls 50,000 men could be drilled, brigaded, and prepared for service. They might not be such troops as one might wish, but still a general, even if in possession of the capital, would not feel easy with such a place in his neighbourhood, and would hardly venture to detach troops either to the west or north, leaving such a place either on his flank or rear. It might, in fact, become the rallying-point even in a conquered country which does not possess another really strong place where an effectual resistance could be organized.

With regard to the other dockyards—Sheerness is favourably situated for defence. The ground in front is a marsh, and an earthen mound there would be a cheap and powerful defence; and two works in front of Chatham, and one in front of Sheerness, would protect these dockyards from insult, and place them in such a position of defence, that it would require an army of 50,000 men, with a heavy siege train, to invest them with certainty of success. They would not be impregnable, of course, nor could they be made so without more expense than the end to be attained would justify. All, however, that is required for them is time to develop their means of national defence, and that could easily and cheaply be obtained.

The fortification of Plymouth is a more difficult problem, the country around it being singularly unfavourable for this purpose, and to make it as strong as Portsmouth would require an immense outlay. But, as in the case of the Medway ports, this is not required; they are either too distant from the capital or from the base of operations to be useful as ports of disembarkation by an invader. All therefore that is wanted is time; and for a sum of less than half a million of money Plymouth might be so fortified as to be safe from a "*coup de main*," if attempted either by land or by sea, and so strong as to require at least 50,000 men to take it within a month or six weeks, in which

time the fate of the nation would be absolutely and certainly decided.

To state the question, therefore, in its simplest terms, it amounts in reality to this: that for a sum of little more than a million of money—or less than we are spending upon our Parliament Houses—the defence of our coast may be made almost absolutely sure and certain, in so far, at least, as we can at present foresee the danger to be guarded against, or the means by which it may be avoided; and if it be so, the present security and ultimate saving of expense to the nation are so great that, unless a man can satisfactorily show that the reasoning is false on which this assumption is founded, I can hardly understand any one not wishing it done, and done immediately.

To exhaust the subject of national defences there are two other points, which, however, I am not going to do more than indicate here. The first is the manning of the navy, which is, of course, as essential as any of the questions mooted in the previous pages, but is one that does not properly come within the scope of the present work, and would require more space to treat of it, as it should be treated, than the limits of this work will admit of.

The other question is, whether or not there should be one strong place inland in which the Bank deposits and books, the Crown jewels, and generally the valuables of the nation, might be deposited in the event of an invasion. No one can doubt its desirability; the only question is—is it worth the expense it would entail? My own impression is that it should be done; but, if it ever is carried out, the first point is that there shall be only one. If two were built, they must be garrisoned, and that would destroy unity of defence, and detach portions of the army that might be more useful if united.

A second point is, that it must not be a fortified town. No house of a private individual must exist within the enclosure or within 1000 yards of the walls, or defence becomes difficult even in the strongest place.

A third condition is, that the place should be in front of London. At first sight it might appear that it should be in the rear; but it is evident that it is as easy to retreat to one in front as to one in the rear before the capital has fallen. After this catastrophe has happened, it is as safe on one side as the other,



and being in front it may be very useful to the defence ; if in the rear, it can take no part in the struggle ; and would, on the contrary, be prejudicial, by withdrawing its necessary garrison from the scene of action.

The only place I know of fulfilling all these conditions is Banstead Downs, in front of Croydon, but whether that is really the best place for the purpose or not I am not prepared to say. If this were done, of course the artillery and their stores should be located there instead of at Woolwich, which, owing to its locality, could never be effectually fortified but at a most enormous and unwarrantable expense.

Taking these propositions in the ratio of their importance, the first, of course, is an efficient and efficiently-manned navy. The next is placing its principal arsenal, Portsmouth, in a perfect state of defence ; and after that comes the necessity of securing the Medway dockyards and Plymouth from attack ; and subsidiary to these, throwing up batteries and mud forts in the bays and places most liable to attack ; and lastly, after these are done or determined upon, comes the question of an inland fort, which is certainly important, but not so pressing.

The nation generally is so fully alive to the importance of an efficient and well-manned navy, that there can be little doubt but that these objects will be attained as far as practicable ; but not being so fully awake to the fact that, without secured arsenals and dockyards, the most efficient fleet is nearly useless, it may be pleaded that but little apology is necessary for publishing a pamphlet to direct attention to that branch of the subject, especially as it is accompanied by an exposition of a mode by which the desired object may be cheaply and certainly attained.

Were the recommendation contained in the preceding pages carried out we need no longer sit cowering before our enemy, weighing his words of war or peace, to guess whether he intended to punish us for our former successes, or would graciously be pleased to forbear ; but we might boldly look the world in the face, and, neither giving nor taking offence, as free men, pursue the path of peaceful industry, which seems our proper and allotted task in the comity of nations to which we belong.

One word in conclusion. Many will say, why publish our weaknesses and lay bare to the stranger the nakedness of the



land? If it could be concealed I should be the last to reveal it. But I have no special sources of information ; what I have seen or know every foreigner may see and know, and, what is more, does know, and knows perfectly. There is not a department in the French army or navy that has not access to perfect plans of all our dockyards and fortifications ; they know every gun that is mounted or laid aside, they know the exact number of our garrisons, and watch with the keenest interest the movements of our fleet ; and not only at head-quarters but in every mess-room, the feasibility and means of attacking England are warmly and keenly discussed ; there is not a well-informed officer in either branch of the service that has not made up his mind on most of the points connected with this subject, or who is not prepared how to act, or what to advise, if called upon. There are, and can be, no secrets in the matter ; and while this is the case, it is not by shutting our eyes, or, like pheasants, putting our heads under a stone, that we shall avoid the danger, but by looking it in the face like men, and meeting it boldly and effectually, which we are easily able to do, and do in a manner which can offend no one.

If we increase our army or navy we give a feasible pretext for others to do so likewise, for ships and soldiers are means of aggression as well as of defence.

If a man walks through the streets with a drawn sword in one hand, a loaded pistol in the other, others must arm also, if they would protect themselves from his insolence or attacks ; but if he merely adds bars and bolts to his doors, and lines his shutters with iron, none but thieves can complain, for these things hurt nobody, and can only be useful to protect property with which no man has a right to interfere. So in the present case, adding to our fortifications can give no offence to any one, while they would add far more to our security than a very considerable increase of either our army or navy, and would be a permanent instead of an ephemeral defence ; and as such I feel convinced it would be well if the subject were taken up at once, and in a spirit to carry it out effectually, so as to enable us to repose once more in peaceful security within our sea-girt shores, instead of virtually provoking war, by exposing to all eyes the richest booty the world affords, so poorly protected as almost certainly to become the prize of the first bold adventurer who dares to strike home to obtain it.

## A P P E N D I X.

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MR. FERGUSSON'S  
SYSTEM OF FORTIFICATION.

BY LIEUT.-COLONEL W. H. ADAMS.

[FROM THE UNITED SERVICE MAGAZINE.]

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DURING the course of the present season, Lieut.-Colonel Adams, Professor of Fortification at the Royal Military College of Sandhurst, delivered three lectures at the United Service Institution, in Scotland Yard, on the general subject of fortification.

The first of these was devoted to the French or bastion system, the defects of which were very clearly pointed out; the Professor proving to demonstration that all the imaginary advantages of flanking defence, which constituted the great principle of this system, were neutralized by the discovery of a mode of attack which annihilated them before they ever came into play.

In the second lecture, delivered on the 28th of April, Colonel Adams explained the mode in which the German engineers had, in their recent works, sought to obviate these defects; in the first place by abolishing the bastion altogether, so as to get a polygonal form of fort, not easily enfiladed, and possessing the advantage of a powerful direct fire towards the country, and secondly by a system of detached forts, which promise important advantages for the defence of fortified places. He then proceeded to show how the French engineers, in their criticisms of the works of the Germans, had overlooked the great fact of this superiority of fire, which in reality constitutes their principal mode of defence.

These two lectures, though most valuable specimens of scientific criticism, and well deserving the attention of military men, as coming from one in the position of Colonel Adams, who, besides his intimate acquaintance with the theory of the art, has had such favourable opportunities of inspecting all the more important of the recent works of fortifications erected in France and Germany, still do not possess that novelty and general interest which we conceive to be necessary to entitle them to a place in such a periodical as this.

The third lecture, however, delivered on the 5th of May, was wholly directed to the consideration of a new system of fortification proposed by Mr. Jas. Fergusson,\* which has not yet been prominently brought before the public, but which, if it possesses even only a portion of the merit and impregnability ascribed to it by Colonel Adams and its inventor, deserves the most serious attention, not only of military men, but of the public also, especially at a time when defensive warfare in general, and especially our own national defences, are occupying so large a portion of public attention. So important, indeed, do we consider the subject, that we scarcely feel that any apology is necessary for giving the lecture entire, which we do in the words used by its author, the MS. having been kindly lent to us for the purpose:—

In bringing before you, and trying to explain the system of fortification announced for this afternoon's lecture, I must request of you to dismiss from your minds not only all prejudice on the subject, but even all preconceived ideas; all, indeed, that you have been taught, and led to believe most firmly established as axioms in this science, and to approach it as a new subject, and as open to a new mode of inquiry. Without this, I fear, it will be almost impossible for me to obtain that hearing for the system I am about to explain which is absolutely indispensable for forming a fair estimate either of its merits or defects; and I am anxious that it should have this fair trial, for, if it does really possess the advantages its author supposes it to have, it is of the utmost importance not only to us, but to all nations, that they should be recognised; if, on the other hand, it is found that the author has been led away by a too sanguine faith in his own discoveries, it is also important that their fallacy should be made apparent.

It doubtless requires no small stretch of liberality, and an unusual freedom from preconceived opinion, to admit that the system of fortification which for the last two centuries has been received by all the best military men of Europe as the only one, and which has during that period commanded the talents of the best engineers and occupied the inventive ingenuity of hundreds of practical and scientific men in every country in Europe;—it is difficult, I say, to believe that this time-honoured system should, after all, prove to be a mistake and a fallacy—that the time of all these men has been misspent, and the millions that have been lavished on the construction of fortifications according to this system should, in a great measure, have been thrown away. Yet if what Mr. Fergusson advances should prove to be true, this is, to a great extent at least, the case.

On the other hand, it will not do for us in the nineteenth century to

\* 'Essay on a Proposed New System of Fortification; with Hints for its Application to our National Defences.' By Jas. Fergusson. London: Weale, 1849.

say that improvement is impossible, and that all that has been done is right. We have seen such startling inventions perfected within so short a period (even contrary to the opinions of the most scientific), and the whole relations of time and space so revolutionised by steam and electricity, that, so far from believing the laws of any science to be immutably and irrevocably fixed, we ought rather to suspect that what has not progressed has got into a vicious direction in which progress is impossible.

In my preliminary lecture I explained to you the changes produced by the invention of gunpowder in the manner of fortifying places, and I traced the improvements made by the French on the original system invented by the Italians, which completed the bastion system in all its essentials, rendering it nearly impregnable by any means of attack known at that time. So tremendous was the fire, and so perfectly was every part seen and defended, and so beautiful, in theory at least, was the whole system of direct and mutual defence, that one cannot wonder at engineers being enamoured of it, and clinging to it long after its fallacies had been exposed. At the same time, however, I showed you how effectually the weak points of the bastion system had been taken advantage of by the inventions of Vauban and the engineers of his day.

The bastion system, then, being proved both in theory and practice to be a mistake, one would naturally have supposed that it would have been at once abandoned by engineers, and that, benefiting by their experience as besiegers, they would have applied the same principles to the DEFENCE of places, and so neutralised the advantages thus gained for the attack. Such, however, has not hitherto been the case. It is true a great number of palliatives, many of which are undoubtedly improvements, have been introduced, but still they are only palliatives; and it is doubtful if the improvements in gunnery and new methods of sapping and mining have not improved the art of attack in even a greater ratio; or, in other words, it is by no means clear that the fortresses erected in Belgium since 1815 could resist as long as their predecessors did in the time of Vauban, if the same RELATIVE force were brought to bear upon them.

At the same time, it must not be forgotten that some men of great eminence have seen the fallacy of the bastion system, and proposed radical changes in it. The most eminent of them are Montalembert and his friend Carnot; but, though their PRINCIPLES were excellent, and generally admitted to be so, they were unfortunate in the mode in which they proposed practically to carry them into effect; and in their own country at least they have met with no acceptance.

In Germany, however, the case is different; and as I attempted to explain to you in the last lecture, the Germans have almost universally abandoned the bastion system, to adopt the principles of Montalembert;



and I have also endeavoured to explain how far they have been successful in their endeavours in so doing.

The question is, nevertheless, still an open one. The German and Montalembert systems have not yet been tested by actual experience in sieges, and most men are therefore cautious in giving their adherence to them.

The attack is still avowedly superior to the defence, and every place depending on art only for its strength (when properly besieged) must fall within a given number of days.

The following table shows on the best authority the expense and duration of resistance of a front of fortification of each of the following systems :—

TABLE A.

	Probable Expense.	Duration of Resistance.
Vauban's 1st system . . . . .	£40,000	19 days.
Vauban's 2nd and 3rd ditto . . . . .	80,000	29 „
Cormontaigne's ditto . . . . .	60,000	30 „
Coehorn's ditto . . . . .	50,000	21 „
Bousmard and Chasseloup's . . . . .	200,000	34 „
Montalembert's . . . . .	300,000	30 „
Carnot's . . . . .	100,000	18 „
Mr. Fergusson's, from . . . . .	8,000 without casemates, to 60,000 complete with them.	

I have before explained that to take a bastion fortress the process is to enfilade the faces and lines of the fort bearing on the attack, by ricochet fire, if you can approach within 600 yards. If you can plant a battery above, or on a level with the parapets, they may be enfiladed with full charges; and assisted by vertical fire from mortars, and counterbattering where enfilade is impossible, the attacking party can always cripple the fire of the fort, so that the trenches of advance can then be made in spite of any counter-fire up to the edge of the ditch or crest of the glacis; and, having reached this point, the besiegers have then the power of erecting breaching batteries within pistol-shot of the ramparts of the fort, by which a breach can be made in the strongest masonry in a few hours, and, its defences being thus destroyed, the fort must inevitably fall.

Now, if it can be shown that Mr. Fergusson's system cannot be enfiladed by ricochet **AT ALL**, that alone would be an advantage over the bastion system; but if it is found, in addition, that the artillery is not to be subdued by **ANY** of the methods employed against the bastion system—that it is much safer from attack by surprise—much less expensive in construction—and that it is much more easily and cheaply garrisoned, since the greater part need not be trained soldiers,—then it must be admitted, I think, to be a great improvement on the bastion, or any other system at present known, and to possess the most important qualities of a strong fortress.

The remedy which Mr. Fergusson proposes for the errors in the bastion system proceeds on two assumptions :—

1st. That the ruling defect in the system is, that it permits the besieger (even with an inferior force in artillery) to subdue the superior force of the fortress.

2nd. That the best method of defence in chess or in war, between individuals or between armies, is to attack; in vulgar but expressive phraseology, not to stand baffling or parrying the blows of an aggressor, but to pitch into him at once, and knock him down, or endeavour to do so.

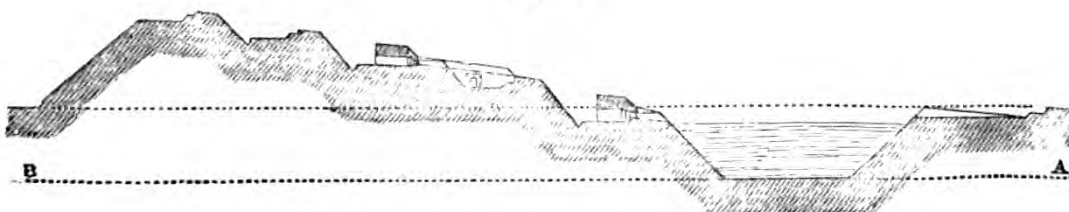
The most brilliantly successful generals have done so; witness Frederick the Great of Prussia, the Russian General Suwarrow, Napoleon Bonaparte, &c.

Constantly bearing in mind that the **WHOLE** success of the operations of a siege depends on the besiegers' power of crippling the artillery fire of the fortress, it is to the prevention of this, in the first instance at least, that Mr. Fergusson directs his attention.

To effect his purpose, he abandons at once all the flanking expedients of the bastion systems, all that engineers have been accustomed to consider excellent, and prepares to meet the enemy face to face (viz. to pitch into him, and knock him down) in the mode I shall now proceed to describe, beginning first with a fort with a wet ditch, as the simplest and least expensive form, and consequently the most easily intelligible, omitting for the present all mention of casemates or other mere accessories. Afterwards I will go on to explain the expedients required to be adopted when wet ditches are not available, or those which may be deemed advisable when expense is not so much a matter of consideration, and how additional strength and security *can* be obtained when the position of the fort is of great importance.

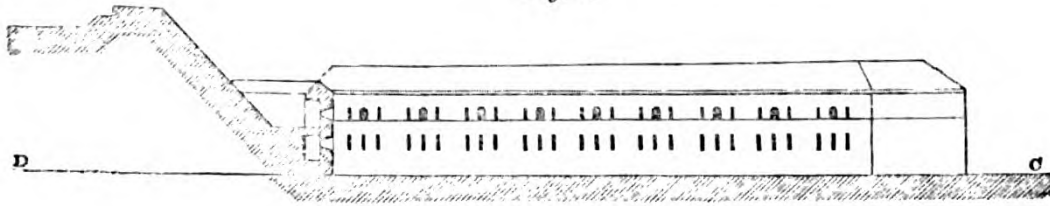
[To supply, as far as may be, the place of the model of Mr. Fergusson's system, to which Colonel Adams continually refers in the course of his lecture, we have had three woodcuts prepared; Fig. 1 showing the general section of a rampart as proposed in this system,—1st, with wet ditch; and, 2nd, with a dry ditch, and the caponniere then required for flanking defence; and, lastly, a plan showing two of the various modes in which Mr. Fergusson proposes to arrange the different parts of his ramparts.]

Fig. 1.



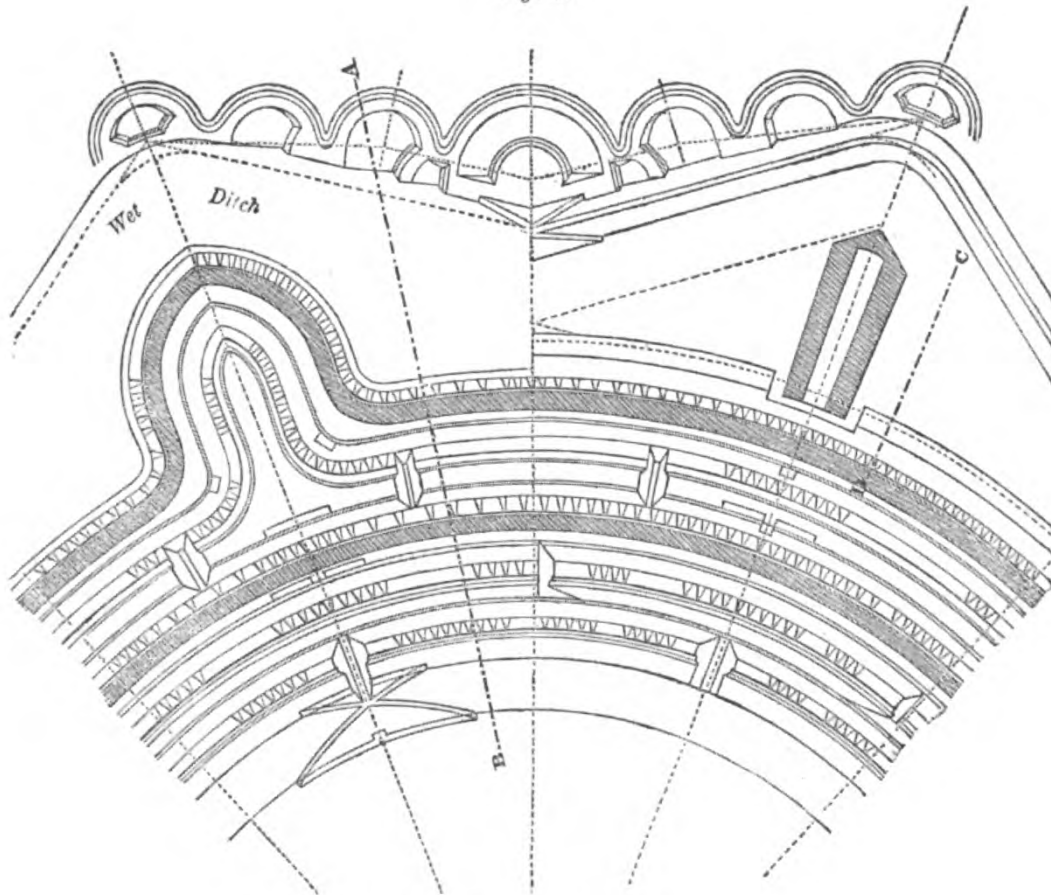
Section of Rampart through A B with Wet Ditch.

Fig. 2.



Rampart with Dry Ditch on Line CD and Caponniere.

Fig. 3.



General Plan of Ramparts.

Most of you are of course aware that the great objection to wet ditches is the difficulty they cause at all times in communicating with the outworks beyond the ditch, and the impossibility there exists in keeping up even that imperfect communication, as soon as the besiegers have crowned the salients of the covered way in front of the bastions, when the outworks fall almost *ipso facto*. This objection does not, however, apply to Mr. Fergusson's system, as, there being no outworks, the communication beyond the ditch is never an indispensable or even a very useful expedient for the defence. This objection being, therefore, disposed of, Mr. Fergusson proposes to dig a ditch, about 60 feet deep and about 200 feet wide, wide enough and deep enough to afford earth sufficient for the erection in its rear of a mound 400 or 500

feet in width at base, and 60 or 80 feet in height ; this he proposes to divide into four or five terraces or terrepleins from 80 to 100 feet in width, with parapets rising 15 or 18 feet the one above the other. In the model (woodcut Fig. 1) before you, five such terraces are shown : the first or lowest, being wholly below the level of the plain, he calls the " fausse braie," or " reserve line ;" as it is not seen at all from the country, and need only come into action should the enemy have been able to reach the outer edge of the ditch. The four upper parapets, as shown in the model and woodcut, are profiled so that each can see the outer edge of the ditch ; and the general outline of the fort being circular, they ALL look directly towards the country, and face the point of attack. In the model, and indeed in any theoretical exposition of the system, it must be shown as perfectly circular, in the same manner that fortresses on polygons, under the same circumstances, are represented as constructed on *regular* polygons ; but this is, of course, by no means a necessary exigence. In practice, any curvilinear form may be adopted that is best suited to the ground, care being only taken that no curve shall be so sharp as to favour enfilade, and that a greater number of guns shall face every point of the ground than can possibly be placed on that spot by the besieger.

The model (woodcut Fig. 3) before you is formed on the dimensions of an octagon of the usual construction ; that is, allowing about 360 yards from the salient of one bastion to the salient of the other ; and this, for the sake of comparison with the old system, has been called a front throughout, though, properly speaking, no such things as fronts exist in this system. On these dimensions the length of the four upper ramparts (without the reserve line) amounts altogether to above 21,000 feet. If the fronts (as they are drawn in Mr. Fergusson's book) were 400 yards from salient to salient, these dimensions would be increased 5000 or 4000 feet ; but confining our remarks to the smaller ones, and deducting 1000 feet for traverses, passages, &c., we have still 20,000 feet, or room for 1000 guns at 20 feet apart, which will admit of splinter-proof traverses between every third gun, if such be thought desirable. By this arrangement it will be observed that, firing directly on one radius of the circle, four guns (one above the other) can at all times be brought to bear on any point of ground in front ; but if the embrasures open so as to allow a gun to traverse twenty degrees each way, nearly 100 guns may be brought to bear on any point in the first parallel, or say at 600 yards from the salients of the fort ; and traversing only 12 or 15 degrees, 50 at least can be brought to bear on any point beyond the glacis. But, in stating this, it must be borne in mind that the enemy cannot place HIS guns on a single point, but must, like the fort, allow 20 feet at least between each gun, or say 2000 feet for 100 guns ; and as, at the distance of 600 yards, this is one-eighth of the circumference of the fort, at least 200 or 250 guns could easily be brought to



bear on them, without obliquing the embrasures at all, or using elevated traversing platforms, and without arming the *fausse braie*.

But before proceeding further it is necessary to cast a retrospective glance on the number of guns usually brought into the field by armies; and to point out the mode of disposing and of using them in a siege; we shall then be better able to appreciate the difference between the advantages obtained by the old system and by that now under discussion.

The number which it is *proposed* (theoretically) should form a siege train by the best engineers will be seen from the annexed table.

TABLE B.

Showing the number of guns, including mortars and howitzers, proposed as a perfect siege train by the following authorities:—

Vauban . . . . .	160
Bousmard . . . . .	168
Durtubi . . . . .	207
Dupuget . . . . .	200
Gassendi . . . . .	160
Austrian equipment . . . . .	178
Prussian . . . . .	142

TABLE C.

Showing the number of pieces of artillery actually brought into the field for sieges during the late war:—

## BY THE ENGLISH.

Ciudad Rodrigo . . . . .	29
Third Siege of Badajoz . . . . .	56
St. Sebastian . . . . .	63

## BY THE FRENCH.

Ciudad Rodrigo . . . . .	50
Badajos . . . . .	54
Lerida . . . . .	40
Almeida . . . . .	67
Tarragona . . . . .	66
Antwerp (1831) . . . . .	144

So that 67 is the number of pieces actually brought into the field by the French at Almeida, 63 by ourselves at St. Sebastian with the advantage of sea transport, and 144 by the French against Antwerp in 1831, when at peace, with all the resources of France and Belgium at command, and against a fortress close to their own territory; while, on the other hand, we are assured by an experienced calculator of these matters—the Baron Meurice de Sellon (who recently published a project of invasion of this country by the French, translated by Captain

Addison)—that to bring up 200 pieces of siege artillery for a siege of Paris would require 36,000 horses and 6000 carriages. I think we may conclude that in time of war, in a hostile country, it would be rare to find 100 pieces of *heavy* artillery brought into battery against a fortress.

Nevertheless, not to favour Mr. Fergusson's system, but to test its merits strongly, we will suppose that the besiegers do bring as many as 100 pieces against it, and putting aside mortars, for the present only, we will suppose them to be 100 24-pounders and heavy howitzers.

In the first place, let us suppose the besiegers to try counterbattering as their best means of using their guns to cripple those of the fort, and for this purpose that they have constructed one large battery for 100 guns; at twenty feet apart this battery would be 2000 feet long, and I have shown that at the same distance apart, and without using elevated traversing platforms, the fort could bring from 200 to 250 guns to bear on the battery; and not only a superior number, but of superior weight of metal, for the heaviest guns hitherto used in sieges have been 24-pounders. In a fort there would be 32-pounders, 56-pounders, and 68-pounders, with 10 and 12 inch guns for shells, and not only of heavier metal, but better placed, some plunging from the high terraces, and some grazing from the low terraces, and covered by carefully profiled and long consolidated parapets. Under these circumstances, there could be no question but that the guns of the fort would soon annihilate the guns of the battery.

As this method of attack by counterbattering is shown to be impracticable, let us suppose that the besieger would disperse his guns on small batteries of ten or twelve guns each (as is usually done in the siege of other forts), and attempt to enfilade the terraces or terrepleins with full charges, or à ricochet.

In the first place, dividing his guns into several batteries would not relieve them from the dilemma of having to sustain the direct fire of two or three guns to one, because a Fergusson fort can bring an equal amount of fire in any direction.

2ndly.—The guns of the upper ramparts could not be touched by enfilade with full charges, for, as they are elevated from sixty to eighty feet above the ground, the angle of elevation at which the besiegers' guns must be fired would cause the shot to pass clear over the terrepleins, without damaging guns or men. The same is true firing à ricochet; the great angle of elevation necessary would prevent the shot from rebounding or doing any damage.

Now, with respect to the lower terrepleins, it is very possible that hereafter the use of large shells, fired horizontally from howitzers, may enable a besieger to cut through the eighteen-foot parapet of a bastion fort, and so enfilade a whole line of terrepleins through the opening; but in a circular fort of this construction, as he must fire in

the direction of a tangent to the curved terreplein, he would have to cut through at least 150 feet of the covering parapet, in order to make the necessary opening.

Now to enfilade the lower ramparts à ricochet, the battery must (as I explained in my first lecture) be formed within about 600 yards of the guns to be subdued, and, the rampart being curved, the battery must be formed on, and fire in the direction of, a tangent to the curve; a battery, for instance, of ten guns, placed so as to enfilade any section of the fort, must be placed in such a position as brings it within 300 yards, or short point-blank range, of twenty-five or thirty guns of superior weight of metal, which can fire down directly into it. It is, therefore, evident from the greater proximity of the fort guns to the battery, added to the superiority of their number and weight of metal, and the further fact of the guns of the fort firing unmolested by any counter-fire (except of mortars from a great and uncertain distance), it would be only a matter of a few minutes to silence any such batteries attempting to ricochet the faces of the fort. But supposing the battery to be unopposed by the fire of the fort, even the precision of modern artillery practice is not sufficient to enable this fire to be used successfully against *curved* lines; for the larger the fort, and consequently the flatter the curve, the more distant must the enfilading batteries be; and the smaller the fort, the sharper the curve, and the more difficult to enfilade successfully. To these facts we must add the facility with which the lower ramparts can be effectually traversed either with projecting batteries, as shown in the model, or with large traverses, the height of the ramparts in the rear, or smaller ones, the height of the parapet, which can effectually be hid by the larger ones. Moreover, there being no convenient crest of the parapet seen, as in the bastion system, by which to direct the fire, such a fire, even if unopposed, would be utterly inefficacious, and, when opposed, cannot even be attempted. So that this mode of attack may be considered as utterly out of the question.

There is another mode of attack which it is believed will have considerable influence on sieges to be undertaken hereafter—viz. the fire of musketry, which, with the improved rifles, would no doubt be most important in keeping down the fire of any fort on the OLD construction. *This* fire, however, is the privilege of the party having the superiority of artillery fire; for, as happens in every siege, the breaching batteries could neither be manned nor used were the guns not protected by mantlets and screens from musketry fire, and these could be knocked to pieces in a few minutes, if the fort had even one gun to bring to bear upon them; under these circumstances, so long as the fort can retain the superiority of artillery fire, it can retain its use of mantlets, and, consequently, neutralize the musketry fire of the attack, while, on the other hand, it can deprive the attack of this expedient, and conse-

quently of one of the most necessary expedients both for offence and defence.

I have now proved, as I think, that the artillery fire of the Fergusson fort cannot be subdued by direct fire or by enfilade either at full charges or by ricochet. It may be asked how the fort is to be attacked at all? The obvious answer to the question which will suggest itself to every one is, that it may be attacked by mortars, and that the defenders might be shelled out of it. To this it might be answered that no fort was ever yet so taken: for we are not of course speaking here of towns which can be bombarded and burnt; or it might be answered that it is as easy, indeed easier, for the fort to have the superiority of vertical, as it has been shown it can have of direct fire; for the besiegers rarely (if ever) have brought forty mortars into the field, whilst the fort might reply with 100 of larger calibre; and as both are mere earthworks, the effect of the shells of the fort against the besiegers would be the same as that of the besiegers against those of the fort. Without, however, having recourse to so expensive a mode of defence, it may be shown how useless an attack by mortars would be against such a fort as I have been describing.

In the first place, shells would be useless for the purpose of killing men; for if they fall on soft earth they bury themselves, and on exploding form a crater which throws their fragments upwards, but renders them innocuous to all around them, except from a chance splinter falling back on some one's head. The rear rampart acts as a parados which shelters the gunners behind; the parapet covers them in front, and the traverses on either side; so that the chances of damage from this source are so small as hardly to be worth calculation. In the next place, to shell down a mound of earth 500 feet wide and 60 feet high is preposterous, or even seriously to damage it. All that is required is, that the garrison should carefully replace at night the earth disturbed, and no amount of shelling could ever seriously affect the safety of the fort. The one purpose shells might be supposed to effect would be dismounting the guns, and so destroying the effective means of resistance of this fort; a very slight consideration, however, will show how little even this is to be feared. For, in the first place, a gun with its carriage covers only from twenty-two to twenty-five square feet, whereas, supposing 1000 embrasures to be armed, every gun has allotted to it 1500 to 2000 feet according to the width of the rampart: so that it would require, on the average, from sixty to eighty shells to be thrown into the fort to hit a gun once; or, supposing that only 500 embrasures were armed (which would be amply sufficient), would it be worth any one's while, could shells be afforded, to pitch 150 shells into a fort for the chance of hitting one gun, and perhaps destroying one carriage?

Hitherto I have been endeavouring to show how well a Fergusson



fort of the *simplest form*, and even *without bomb-proofs*, can preserve its artillery, and resist the attacks of an enemy.

But, notwithstanding that it is evident from what I have said that this sort of fort cannot have its fire crippled by any of these means, still it is easy to perceive how desirable and advantageous it would be that bomb-proof shelter should be afforded for at least a portion of the garrison (as they must have barracks somewhere), and for part, at least, of their artillery. And this it is purposed by Mr. Fergusson should be done by covering some guns on each rampart with Haxo casemates, which would amply suffice to meet this objection. (In the section, woodcut Fig. 1, the guns of two ramparts are represented as protected by these Haxo casemates.)

These masonry blindages were first applied to flanking guns by General Haxo, of the French artillery, but are here used to an extent their inventor never dreamt of. In this mode of casemating, the parapet and embrasure remain exactly as on an open rampart; all that is done is to throw an arch or vault over the gun, covered with a sufficiency of earth to render it shell-proof; and if the earth is carefully replaced when knocked away, the guns may be preserved from damage to the end of the siege; while, if the superiority of direct fire is maintained (as I have shown it can be), the little piece of masonry which is exposed has nothing to fear either from shells thrown by mortars, or pitched at a low angle from howitzers or shell-guns; and besides the use for the defence of guns, these casemates are amply sufficient to protect a body of men from the distant fire of mortars under discussion, and quite to neutralize that mode of attack.

Having explained, as far as is perhaps necessary, the arrangements of a fort of this description with wet ditches, let us now turn to the modifications necessary when water is not available, and dry ditches must be used. These modifications require no change in the upper works; the ramparts remain the same, in all respects, whether the ditch be wet or dry; so virtually does the ditch, except that instead of water a wall must be placed in it, to prevent the possibility of an escalade, or attack by surprise.

For this purpose Mr. Fergusson recommends a wall built something after the manner of those proposed by Carnot, loopholed for musketry in two tiers, and placed at the bottom of the slope of the escarpe, so that the earth does not press against it, and its destruction does not bring down the parapets, nor at all interfere with the main works of the fort. Owing to the capacious dimensions of the ditch, this can easily be done without encroaching on any necessary space, for, from the immense quantity of earth required for the mound of ramparts, the ditch cannot in any case well be less than 60 feet deep, 80 or 100 feet broad at bottom, and consequently 200 or 220 broad at the plane of site. Besides forming a most serious obstacle to an attack in any form, this

depth of ditch enables Mr. Fergusson to place his masonry so low as most effectually to protect it from injury from the fire of the besiegers' batteries, which is certainly not the case with the masonry of forts of the usual construction, where the cordon of the wall is level with the crest of the glacis, or of the covering mass. The improvements in artillery, as demonstrated by the Woolwich experiments, have shown that masonry so placed can be destroyed from the 1st or 2nd parallels; but when the cordon is thirty feet below the plane of site, it may be considered as perfectly safe from any fire yet invented, and even when the enemy has reached the counterscarpe he must depress his guns to a very inconvenient angle to touch even the top of the wall, and not less than seventeen or twenty degrees, if such be possible, to hit the base. Mining under a ditch sixty feet deep may also be considered as out of the question; yet till the wall is destroyed, an attack of the fort itself is impossible; for no troops can escalate a wall thirty feet in height, if properly and sufficiently flanked as this is, and loopholed throughout for musketry.

In all respects, therefore, the siege of a fort of this class with dry ditches may be considered as difficult as that of one with wet ditches; and as the same remarks apply to one as to the other, I need not again repeat what has already been said on the subject.

To resume, therefore, the principal points upon which we have insisted above, the first difficulty of the besieger is to subdue the superior fire of the fort; the next to sap up to the front he has damaged, in doing so entirely masking his own fire, so as to allow the besieged to repair damages; the third, to open breaching batteries under the fire of the reserved ramparts, and within musketry distance from all the others; the fourth, to pass a ditch wider and deeper than ever yet was passed in any siege; the fifth, to ascend an escarpe sixty feet in height, which may be mined and entrenched to any extent; and lastly, to storm five successive ramparts, which, though damaged, cannot be destroyed. All these are obstacles greater than have yet been overcome, and such as we do not yet see the means which would enable us to cope with them.

It only remains now to notice one or two minor points, such as expense of construction, amount of garrison, amount of ammunition and artillery, and such like, which, though not exactly bearing on the question of the impregnability or otherwise of a system of fortification, are still most important items in ascertaining whether it is or is not desirable to adopt it.

Referring again to Table A quoted above, we see what is the expense of a front of fortification of 400 yards, according to the usual systems. On the present occasion, of course, it will be impossible for me to enter into all the details of the calculations necessary to explain the various items. I shall, therefore, merely state from Mr. Fergusson's book the result he arrives at, only adding that the data on which he founds his

calculations appear to me to be trustworthy, and, if anything, he has exaggerated against himself the expenses.

The fort in its simplest form is merely a mound of earth surrounded by a wet ditch ; it is easy therefore to ascertain the number of cubic yards of earth to be removed, and the distance ; the price also, after our railway experience, can be easily ascertained. On these data Mr. Fergusson calculates that a front according to his system would cost only about 8000*l.* or 10,000*l.*, assuming a front to be a length of 360 or 400 yards, as in the old system, and the same for all the fronts, except that, where wet ditches are not available, revêtements are required, and these he calculates would cost in their simplest form about 20,000*l.* per front, and in the most complicated about 30,000*l.* If, on the other hand, it is necessary to casemate some of the guns, or in other words to provide bomb-proof shelter for a certain portion at least of the garrison, such casemates as Mr. F. proposes would cost about 120*l.* per gun ; and if 100 of them were applied to each front, or say 800 for the whole fort, the additional cost would be about 12,000*l.* per front ; and allowing 6000*l.* or 8000*l.* for unforeseen extras, it will be found that a fort in its simplest form may be constructed for 8000*l.* or 10,000*l.* per front, and need never cost more than 60,000*l.*, if so much ; the latter sum being under the cost of the best bastion systems, although casemated barracks are not included in the cost of their fronts, as in Mr. Fergusson's they are.

The amount of ammunition required is not so easily calculated, but it certainly would be less than the old system. Supposing, in the first instance, that the fire of the fort was so *evidently overwhelming* as to render the contest of the two artilleries hopeless, no batteries would be opened, and the expenditure consequently nil. But supposing the contest commenced, and often renewed, it never could last long, though terrible while it lasted ; and once the artillery of the attacking party was silenced, no further expenditure would be required. It would be absurd to waste powder in little chicanes, as is usually done in modern sieges. Whenever the fort is required to exert itself, it must and should be done, and with a crushing power. This must settle the matter at once, and effectually. At the same time it should be borne in mind that, though the fort is CAPABLE of mounting 1000 or 1200 guns, it by no means follows that this MUST be done ; all that is required is, a force superior to that brought against it. If the attacking force bring 150 or 200 guns, the fort must be prepared to answer with 300 or 400 ; but if they are supplied with half or two-thirds the amount of ammunition usually considered necessary, it will be found, I believe, more than sufficient for successful resistance. Perhaps an instance will make this clearer. Suppose two batteries, of ten guns each, to be erected in perfectly similar circumstances, at a distance of 500 or 600 yards from one another, and each supplied with 500 rounds of ammunition per gun,



they may fire away at one another for a week, or a month, and expend their last shot before either gains a victory over the other. But if we suppose one battery to have twenty guns with only 250 rounds, the other remaining the same, I think there is very little doubt which battery would have the best of the fight; or, if we take an extreme instance, and place in one battery fifty guns, with 100 rounds to each gun, opposite the 10-gun battery provisioned as before, it is tolerably evident that the smaller one never could make any impression on the larger one, but, on the contrary, that a salvo, or volley, from fifty guns would sweep the 10-gun battery from the face of the earth. So much is this the case, that I look upon it as a position capable of almost mathematical proof, that, the quantity of ammunition remaining the same, the superior number of guns will always have the advantage over the smaller number.

The same remarks apply to the garrison. The number of men absolutely required is just that number which suffices to work such a number of guns as are sufficient to silence the enemy's batteries—a reserve is of course important.

Now if we suppose that the fort is of such importance that the enemy can and will bring against it 100 pieces of artillery, and that 300 pieces are to be used against them at one time, then about 5000 or 5400 men would be sufficient, of which only 500 or 600 need be trained artillerymen. For although eighteen men for each gun employed at one time are here allowed, three reliefs will not be called for as in the bastion forts; in the Fergusson fort continuous action is not supposed necessary, and only short, though perhaps frequent, exertions are contemplated. The remainder of the garrison, over and above the 500 or 600 trained artillerymen, may be taken from the infantry, as in the French service; or (in maritime places) dockyard battalions, coast-guardsmen, or men-of-war-men, are as fit for this work as the best soldiers in the army; and in inland places, pensioners, and even volunteers or militiamen, can easily be trained to this, which is virtually the simplest manœuvre in the whole art of war; no sorties being required, and indeed no one manœuvre, but firing big guns as on board a man-of-war; musketry only coming into play when the guns are destroyed, neither infantry nor cavalry, nor indeed any other arm, is required for the defence of places constructed on this plan.

To take a modern instance to make this clearer, as is shown on the table, the French brought against the citadel of Antwerp a model train of 144 pieces of artillery of all sorts; had it been built according to the system I am now explaining, it would, in the first place, owing to its command of water, have cost certainly not one-fourth part of its actual cost of construction, and all that would have been required for its defence would have been to throw into it 300 guns of sorts, 600 artillerymen, 4600 assistants from the line or elsewhere. So provided,



the French never could have opened a battery against the place, nor are there any means they could have employed which would have insured its surrender within any calculated time; whereas, notwithstanding its cost, its garrison, and its immense provision of all sorts, it fell in twenty-one days of open trenches, and no expedient could have retarded its fall many days beyond its allotted time.

During the short space of one hour (short for reviewing an entire system) I could do little more than draw your attention to the most *striking* advantages of Mr. Fergusson's system, and explain some few characteristics, which might, without explanation, have been set down as defects. Those who feel interested in the matter must read Mr. F.'s book to satisfy themselves on minor particulars; in doing so, however, I must guard them against falling into that unfair path of criticism which attempts to pin down an author to details *not* affecting the principle. For example, Mr. Fergusson has made in his model five terraces and parapets; he is not bound to five, there may be less or more according to circumstances; neither is it necessary absolutely that one should be below the level of the ground. The fort is not bound to be circular, nor of the size of an octagonal bastion fort; it might be an oval, and surround the city of Paris, which has ninety-four fronts. The author recommends a Carnot's detached wall, in a dry ditch, to prevent surprise; but it may be any wall, and, if thought necessary, may be flanked with towers at the bottom of the ditch; and so with numerous other details, as to armament, &c. &c. With these observations, I can confidently leave Mr. Fergusson's system to work its own way to success.