

REPORT OF THE COMMISSIONERS APPOINTED TO CONSIDER THE DEFENCES OF
THE UNITED KINGDOM; TOGETHER WITH THE MINUTES OF EVIDENCE AND
APPENDIX; ALSO CORRESPONDENCE RELATIVE TO A SITE FOR AN INTERNAL
ARSENAL

Presented to both Houses of Parliament by Command of Her Majesty

LONDON:

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MAJESTY FOR HER MAJESTY'S STATIONERY OFFICE 1860

CONTENTS

COMMISSION

MEMORANDUM OF INSTRUCTIONS

LETTER TO THE COMMISSION

REPORT

[not yet: CORRESPONDENCE RELATIVE TO SITE FOR AN INTERNAL ARSENAL MINUTES OF EVIDENCE APPENDIX]

VICTORIA, by the Grace of God of the United Kingdom of Great Britain, and Ireland, Queen,
Defender of the Faith,

To Our trusty and well-beloved Sir Harry David Jones, Knight, Commander of the Most Honourable
Order of the Bath, Major General in Our Army ;

Our trusty and well-beloved Duncan Alexander Cameron, Companion of the Most Honourable Order of
the Bath, Major General in Our Army;

Our trusty and well-beloved George Elliot, Rear Admiral of the Blue in Our Navy;

Our trusty and well-beloved Sir Frederick Abbott, Knight, Companion of the Most Honourable Order
of the Bath, and Major General in Our Indian Forces ;

Our trusty and well-beloved Astley Cooper Key, Companion of the Most Honourable Order of the
Bath, and Captain in Our Navy ;

Our trusty and well-beloved John Henry Lefroy, Lieutenant Colonel in Our Royal Regiment of
Artillery, and Colonel in Our Army; and

Our trusty and well-beloved James Fergusson, Esquire, greeting:

Whereas We have thought it expedient, for divers good causes and considerations,
that a Commission should forthwith issue that inquiries may be made by Our Commissioners
into the present state, condition, and sufficiency of the Fortifications existing for
the Defence of Our United Kingdom, and examination had into all Works at present in
progress for the improvement thereof, and consideration given to the most effectual
means of rendering the same complete, especially to all such Works of Defence
as are intended for the protection of Our Royal Arsenals and Dockyards, in case of any
hostile attack being made by foreign enemies both by sea and land:

Now know ye, that We, reposing great trust and confidence in your zeal, knowledge,
and ability, have authorized and appointed, and do by these presents authorize
and appoint, you, the said Sir Harry David Jones, Duncan Alexander Cameron, George
Elliot, Sir Frederick Abbott, Astley Cooper Key, John Henry Lefroy, and James
Fergusson, or any five or more of you, to be Our Commissioners, for the purpose of
such inquiries as aforesaid, and that you may offer such suggestions as may seem to you
meet, as (regard being had to the works completed and in progress, and to the ordinary
number of Our Royal Artillery, voted by Parliament) will render Our United Kingdom
in a complete state of defence.

And for the better enabling you to carry these Our Royal intentions into effect, We
do hereby authorize and empower you, or any five or more of you, to call for, have access
to, and examine all plans, designs, estimates, and contracts for all works of defence now
in progress or under Our consideration, or any other plans or designs that may be laid
before you for the same object.

And We do give and grant to you, or any five or more of you, full power and
authority to call before you such persons in Our Civil, Military, or Naval Services as
you shall judge likely to afford you the best and fullest information upon the subject of
this Our Commission, and to inquire of and concerning the premises by all other lawful
ways and means whatsoever.

And We do by these presents will and ordain, that this Our Commission shall continue
in full force and virtue, and that you, Our said Commissioners, or any five or more
of you, may from time to time proceed in the execution thereof, and of every matter
and thing therein contained, although the same be not continued from time to time by

adjournment.

And Our further will and pleasure is, that you, Our said Commissioners, or any five or more of you, upon due inquiry into the premises, do report to Us, in writing, under your hands and seals, your several proceedings, under and by virtue of this Commission, together with what you shall find touching or concerning the premises.

And We further ordain, that you, or any five or more of you, may have liberty to report to Us your proceedings under this Commission from time to time, should you judge it expedient so to do.

And for your assistance in the due execution of these presents We have made choice of Our trusty and well-beloved William Francis Drummond Jervois, a Captain in Our Corps of Royal Engineers and Major in Our Army, to be Secretary to this Our Commission, and to attend you, whose services and assistance We require you to avail yourselves of from time to time as occasion may require.

Given at Our Court at Osborne, the twentieth day of August, in the twenty-third year of Our reign.

By Her Majesty's Command,
SIDNEY HERBERT.

MEMORANDUM of INSTRUCTIONS for the ROYAL COMMISSION on the DEFENCES of the UNITED KINGDOM.

The Commission will examine the plans of the works now in progress at

Portsmouth (including the Isle of Wight and Spithead),
Plymouth,
Portland,
Pembroke,
Dover, and
Chatham and the Medway ;

and having made themselves acquainted with the plans now being acted on, will proceed to those places, there to inspect the ground.

The Commission will consider what will be the best means of rendering these dockyards and places defensible within as short a time as possible, in order to be prepared for any sudden emergency, and how they can be put in the most complete state of defence by permanent fortifications.

In considering these questions, the Commission will bear in mind that the works now completed, or in progress, or which, having already been decided upon, and the working plans prepared, (although the work itself may not actually have been commenced) have already received the Queen's sanction, after long and mature consideration, should be treated as part of any general scheme of defence which the Commission may recommend.

In deliberating on the various plans, and in forming their conclusions, the Commission must take into consideration the small amount of force generally maintained by this country, and especially the limited number of Royal Artillery which is likely to be disposable for the defence of our fortified places.

The Commission should commence their inquiry with the case of Portsmouth, where the greatest difficulties are supposed to exist, and opinions appear most to differ as to the further measures which should be adopted to overcome them.

The Commission will also consider what steps should be taken for defending the approaches to Woolwich, and what defensive works, if any, it may be necessary to construct with a view to its protection against an attack by land; which would at the same time form an important element in the means of defence for the metropolis.

(Signed) SIDNEY HERBERT.
War Office,
20th August 1859.

War Office,
25th November 1859.
SIR,

I HAVE the honor to acquaint you that Her Majesty's Government have decided that it is desirable that the store of guns and warlike matériel should no longer be concentrated in one place. You are probably aware that a previous Commission had recommended Weedon as a depot for such stores. I have therefore to request that the Commission of which you are President will proceed to Weedon, in order to examine

and report whether the locality affords facilities for such defence by entrenchment as would be necessary to afford security for the valuable public property which it is proposed to deposit there.

I may take this opportunity of adding that I understand that all the dockyards have now been visited, with the exception of Haulbowline at Queenstown; and I should be glad if the Commission would visit that establishment, and report on the means of defence necessary to protect it from attack.

I have the honor to be,
Sir,
Your obedient Servant,
(Signed) S. HERBERT.

Major General
Sir Harry D. Jones, K.C.B.

REPORT.

TO THE QUEEN'S MOST EXCELLENT MAJESTY.

We, the undersigned Commissioners appointed by Your Majesty for inquiring into the present state, condition, and sufficiency of the fortifications existing and projected for the defence of the United Kingdom, and for considering the most effectual means of placing the kingdom in a complete state of defence, have visited the several places referred to in the Instructions signed by Your Majesty's Secretary of State for War, hereto annexed: and having taken the other steps necessary to the accomplishment of the duties with which we have been entrusted, we humbly beg leave to lay before Your Majesty the result of our deliberations up to the present time, together with Minutes of Evidence which we have taken on the subjects connected therewith.

1. In taking into consideration the general question of the defence of the United Kingdom against foreign invasion, Your Commissioners turned their attention in the first instance to the Channel, and to our naval resources as the means of retaining the command of it. This is the first and most obvious line of defence; but it is one which could not, in our opinion, be entirely relied upon at the present day, even if England had no greater external interests to protect than the countries which may be opposed to her. Its adoption would involve the necessity of retaining in the Channel, for purely defensive purposes, a fleet equal to any which could be brought against it, not only by one European State, but by any probable combination of maritime powers; and this in addition to the other fleets and cruizers which are required for the protection of our vast colonial empire, our military communications with distant dependencies, our extended commerce and interests in every quarter of the globe. In this respect England is differently circumstanced from other European States; for were an undue proportion of her fleet to be tied to the Channel for home defence, it must result that theirs would be proportionately set free; to the great danger of our colonies, and the injury of a commerce which becomes of more vital importance with every successive step of national progress. The larger standing armies and the extensive fortresses possessed by the great European powers, would, at the same time, supply the requirements of home defence to themselves.

2. During the wars in the early part of this century, when the strength of the Royal Navy had attained an extraordinary development, it was equal to the performance of all the duties imposed upon it; but it appears doubtful to Your Commissioners, having regard to the present state of continental navies, whether even a fleet of such magnitude as we then possessed, would now be able to perform them all efficiently. A much larger proportion would be required for purely defensive purposes than previously, owing to the certainty with which the movements of fleets can be combined by the aid of steam, and the rapidity with which a large force can be concentrated at a given time on any point. Even if it were possible that a fleet sufficient to meet the emergency of a sudden naval combination against this country could be kept available and fully manned in time of peace, such an application of the resources of the nation would lead to an outlay of the public revenue far exceeding the expenditure which would suffice for that object under other circumstances. The first cost would be very great, and the necessary expense for maintenance would be continual, involving the employment of a large additional number of trained seamen,—a class of men who can with difficulty be obtained, and who are necessarily the most costly of any branch of the military service, owing to the various qualifications required of them. A periodical renewal of the entire fleet would, even under ordinary circumstances, be requisite about every thirty years, without regard to those changes which are unavoidably caused by the present transitional state of naval architecture, and the rapid progress of mechanical science; in which changes we are compelled to take the lead in order to maintain our maritime supremacy.

3. Independent of these considerations, it appears to Your Commissioners that it would be very unsafe to rely on the experience of former wars in judging of this question.

Since the peace of 1815 the state of naval warfare has been revolutionized. The introduction of steam may operate to our disadvantage in diminishing to some extent the value of superior seamanship; the efficient blockade of an enemy's ports has become well-nigh impossible; the practice of firing shells horizontally, and the enormous extent to which the power and accuracy of aim of artillery have been increased, lead to the conclusion that after an action even a victorious fleet would be more seriously crippled and therefore a longer time unfit for service. Added to these contingencies, circumstances may occur to prevent the fleet being at the required spot at the required time, or it may be disabled by storm, and it is possible that it might be overpowered. Should any such catastrophe occur, or should the fleet, from whatever cause, be unable to keep the command of the Channel, it appears to Your Commissioners that the insular position of the kingdom, so far from being an advantage, might prove a disadvantage for defensive purposes, inasmuch as it would enable any superior naval power or powers to concentrate a larger body of troops on any point of our coasts, and more rapidly and secretly, than could be done against any neighbouring country having only a land frontier; and an army so placed could maintain its base and be reinforced and supplied, with more facility than if dependent on land communications. The experience gained from the late Russian and Italian wars goes far to prove this.

These and other considerations of minor but cumulative importance have led us to the conclusion that the nation cannot be considered as secured against invasion if depending for its defence on the fleet alone. At the same time we fully recognize the immense importance of the Channel as a first line of defence, and of a Channel fleet to maintain it; and cannot urge too strongly on the Government of the country that every means should be taken to ensure the efficiency of that fleet.

4. Strongly impressed as Your Commissioners are with the absolute necessity of maintaining our naval superiority for the defence of our own shores, the protection of our colonies and commerce, and of our interests both at home and abroad, we have addressed ourselves to the consideration of the defence of our naval arsenals and dockyards with a full conviction of the primary importance of that measure. Without secure ports in which a fleet can find refuge in case of disaster, or temporary inferiority, and without dockyards and workshops where damages can be repaired, or new ships fitted out; a fleet must be like an army without a base of operations; and our naval power, in the event of a single reverse, be exposed to annihilation.

If the inviolability of our shores cannot be secured by the fleet alone, neither can our arsenals and dockyards rely upon it solely for protection. To station permanently at each of them a naval force sufficient for its defence and having no other object, would be inconsistent with the duties of a fleet, and would in fact be using the navy to maintain the dockyards, instead of the dockyards to maintain the fleet.

It is, then, necessary that our attention should be turned to other means, in addition to the fleet, both for the defence of the country at large and for the security of our dockyards and arsenals.

5. Since the application of steam to the propulsion of vessels, we can no longer rely upon being able to prevent the landing of a hostile force in the country. The circumstances relating to the landing of the British army in Egypt in 1801, or to that of the allied armies in the Crimea, can scarcely be taken as illustrative of the nature of the operations necessary for obtaining a footing in England. In both those instances a long voyage had to be undertaken before the army arrived at its point of landing, and still they were successful; in the former case in face of a powerful opposition: but for a descent upon this country the enemy might only have to cross a narrow channel, where every coasting vessel and fishing boat would be available as a transport, in addition to the organized means which he would have at his disposal, and which could be rapidly increased if circumstances threatened a rupture with this country.

The object of the enemy would be in the first instance to land a sufficient force on some unprotected part of the coast, to enable him to seize and hold a position under cover of which the invading army might be disembarked. With the power of concentration which steam now affords, such a force might be assembled before daylight upon any point selected for the attempt, and thrown on shore in two or three hours.

We cannot admit that moveable batteries of field guns, and the few thousand riflemen who might be available on any given point, would effectually prevent the landing of a hostile force; even if they happened to be at hand exactly when and where required. The advanced division of the enemy, it must be remembered, would be entirely unencumbered, and, every conceivable method being adopted for rapid disembarkation, would push for the beach in a line of considerable extent, covered by a heavy fire from the ships-of-war accompanying the expedition. Doubtless the defence would be somewhat aided by railroads and the telegraph; but whilst either real or feigned attempts were made on several positions, troops could not be detached from the threatened localities; and in the event of the attack succeeding in any one instance, the enemy would secure a position which would serve for the disembarkation of the entire hostile army.

Circumstances may no doubt arise to prevent the success of such an attempt; but

Your Commissioners submit that it would be unwise in the extreme to rely upon such a contingency; that to do so only tends to invite invasion, and to give rise to those recurring alarms which periodically, and not without grounds, take possession of the public mind.

6. The most obvious measure of the resources possessed by any nation, for resisting an enemy established within its frontiers, is the numerical strength of the forces which can be brought into the field to resist the aggressor, the nature and relative state of efficiency of the two armies being at the same time carefully appreciated.

In this country the regular standing army must always be small as compared with those maintained by the military powers of Europe. The principles of our constitution are inimical to the maintenance of a large standing army; the expense of a force brought together by voluntary enlistment is necessarily much greater than that of one raised by conscription; while the demand for foreign and colonial service must always, in time of peace, confine within narrow limits the number of troops at home, which would be available in the outbreak of a war to resist an invasion of the country. Even when joined to such portion of the militia as may be sufficiently trained to act with the regular army, the force capable of manoeuvring in the field can never be compared, in point of numbers, to the disposable forces of any of the great continental nations.

7. A great effort has recently been made by the people of this country, under the encouragement of the Government, to remedy this glaring inferiority of numbers, by the enrolment of volunteer riflemen. The movement has hitherto been so successful, that if continued with the spirit with which it has commenced, it may go far to obliterate this numerical disparity. It must, however, be borne in mind, that such a body of men must necessarily, at the commencement of a struggle, be unable to meet the regularly disciplined soldiers of continental armies on anything like equal terms; and one great question which must now engage the attention of the Government of this country, is to determine how this volunteer enthusiasm can best be utilized to the service of the State.

8. Having carefully weighed the foregoing considerations, we are led to the opinion that neither our fleet, our standing army, nor our volunteer forces, nor even the three combined, can be relied on as sufficient in themselves for the security of the kingdom against foreign invasion. We therefore proceed to consider that part of our instructions which directs our attention especially to fortifications.

9. The objects proposed to be obtained by fortifying any place are, to enable a small body of troops to resist a superior force which may attack it, or to enable partially trained bodies of men to contend successfully with those more perfectly disciplined than themselves. There seems no reason to doubt that such troops as may be got together from the disembodied or less perfectly trained portion of the militia, with local or other volunteers, would, with an admixture of regular soldiers, be able to defend our dockyards against very superior numbers, when fortified with due regard to these principles.

10. Should a system of defence by fortification not be adopted, it is evident that if an enemy should succeed in landing on our shores a larger number of troops than our regular manoeuvring army might consist of at the time, he would be enabled to hold that army in check, while he despatched a considerable body of men to attack any of our dockyards. Such a mode of attack is by no means improbable, as the destruction of our dockyards would be one of the most effectual modes of depriving us of the power of refitting our fleet; and, by thus enabling the enemy to retain that naval superiority he must have possessed, in order to effect the invasion, would at the same time secure his base of operations and his power of obtaining the necessary reinforcements, besides doing much to ensure his ultimate triumph over an essentially maritime State. To defend ourselves against such a mode of attack, it would be necessary, if the dockyards be not fortified, to maintain in each of them such a body of regular troops as might be able to resist in the field any corps that might be detached against it, or else to detach a sufficient force from the main manoeuvring army for that purpose. To accomplish either object, it would be necessary to place our manoeuvring army on the same footing as to numbers with that of any power likely to attack us, and would require such an enormous development of the regular standing army of the country as, in the opinion of Your Commissioners, would be utterly impracticable, and involve an expenditure which could not be borne by the resources of even this nation.

11. A large permanent increase to the regular army, taking into account pay, clothing, provisions, barracks, pensions, and all other expenses, would involve an annual charge to the country which may be calculated at from £60,000 to £70,000 per one thousand men. This sum would be irrespective of the expenses of raising the men, which we take at £11 a man, and of the necessary increase to barrack accommodation: which on the present scale would amount to at least £100 a man; making a first charge of £111,000 per one thousand men, and an annual charge of £60,000 to £70,000.

We do not express an opinion as to the permanent increase to the army which would be necessary under the circumstances supposed. It would, however, cost upon this

calculation about eight millions at the outset, and nearly four millions annually afterwards, to double the number of regular troops now at home, viz. about 66,000 men, exclusive of the Indian depots ; and this would not be an extraordinary increase if the aid of fortifications were to be rejected.

The same eight millions expended in fortifications, would be far more effectual for the defence of the dockyards than any such increase of the regular army, would incidentally provide barrack accommodation for some thousands of men, and would entail no future annual charge, beyond a small sum for maintenance, and the expense of embodying the substitutes for regular troops, whether volunteers, fencibles, or militia, for three weeks training ; which could not much exceed one twentieth of the cost of an equal regular force.

12. The distinction pointed out above between the irregular forces of the army, who would be principally available for the defence of fortifications, and the regular manoeuvring army, which would by their agency be set free to act with vigour in the field, disposes of the objection that men are "locked up" in fortifications, and so prevented from taking their share in the defence of their country. It might to a certain extent be applicable, if it were proposed to construct strategical fortresses, to serve only as bases to the army; but it must never be overlooked, that our very existence as a nation may depend on the safety of our dockyards, and consequently that by some means or other they must be defended. The choice lies only between defence by a small body of men, with the aid of fortification, or defence by a large body without that aid ; in the latter case, the troops must be sufficient in number, and competent in their organization, to cope with any division of the enemy's forces that may be sent against them, and if they are defeated the immediate capture of the place ensues.

We are thus led to the conclusion, that by a judicious application of fortifications the means would be afforded of utilizing in the highest degree both our fleet and the regular army, and the forces which would be brought in aid of it; and, further, that without fortifications there is no mode of defence which can be proposed, that would give the same amount of security to the country, and at the same time be so economical both in money and in troops.

13. If it were possible by fortifications to deny to an enemy the use of all the bays and harbours along the coast, in which he could land his stores and materiel, or on which he could base his operations, such would probably be the most satisfactory solution of the problem. It is, however, evident that the idea of fortifying the whole of that portion of our coasts which is open to attack, cannot be entertained.

In the line of coast from the Humber to Penzance, which is about 750 miles long, there is an aggregate of nearly 300 miles on which a landing may be effected.

It would be impossible to fortify, or if fortified to defend, so extended a line of coast, so as to prevent an enemy from effecting a landing, prepared as he would be for a considerable sacrifice of men and materiel in carrying out his object.

14. Your Commissioners are therefore of opinion that the fortifications of this country should be confined, chiefly, to the protection of those vital points at which an enemy would strike; and of harbours whose possession would give him sure bases of operations in positions favourable to his designs.

There are also certain harbours which, although not of sufficient consequence to be used by themselves as bases for extensive operations, would nevertheless afford an enemy, if he possessed them, facilities for landing guns, horses, and matériel; and at these it appears advisable to have some degree of permanent defence, in order to deny their use to him, and cause him some delay by restricting his operations to the open beach, until he had succeeded in capturing the defences. It is desirable also that works of defence should be provided for our commercial ports. The security of several of these would be of the utmost moment to the trading interests of the country; and others have a military value independent of their commercial importance; but ports of this character are not subject to attacks on a great scale, such as would be brought to bear on the royal naval establishments. The measures for their defence would be of comparatively small extent, and they have not been included in those which have been brought under our consideration by Your Majesty's Government.

15. Without under-estimating the resources of the Thames, the Mersey, the Tyne, the Clyde, and other great centres of the commercial marine, we believe that the specialities of the Royal Navy are such as to render it impossible for any or all of them to make up for the loss of any of our dockyards. We regard these Government establishments, then, especially as vital points. They furnish the means of maintaining our power at sea, by the vast stores, the appliances for the construction and repair of ships-of-war, and the other resources contained in them. The same localities are also depositories of stores for the land service. The harbours in connexion with them afford shelter for our ships-of-war laid up in ordinary, and for those which being in commission require to be repaired and refitted. It would be the work of many years to restore the dockyards, and replace the ships, if their destruction were effected by an enemy; and it is impossible to calculate what might be the other consequences of such a disaster. Woolwich, which is at present our only

great depot for munitions of war, whether for land or sea service, and the place in which these stores are produced, must also be considered a vital point. It is difficult to over-estimate the consequences of the loss, or even of a temporary suspension of the operations of that great arsenal, as at present constituted. during a state of war. It would be felt throughout the empire. Lastly, we consider the harbour of Portland, from its situation and capabilities; that of Dover, from the position which it occupies; and that of Cork, the naval station of Ireland; to be points requiring more or less special consideration with respect to fortifications for their protection.

16. Whilst we are considering the protection of the vital points against which an enemy, intent upon inflicting a heavy blow upon the country, would direct his efforts, the question of the defence of London presents itself. There can be no doubt that the main object of an enemy invading the country, would be to push for the capital, in the hope that if he succeeded in obtaining command of it, such a disaster would result in our buying him off upon any terms he might think it expedient to exact. While on this subject we beg to call attention to an opinion of Lord Overstone, given in answer to our inquiries, which will be found in the Appendix.

A sense of the vast importance of shielding the heart of the empire against attack, has led several military men, both English and foreign, at different times, to propose plans for defensive works round the metropolis.

The defence of London, however, has not been brought under our consideration, and it is therefore only necessary to point out that it does not materially affect the conclusions we have arrived at, with regard to the fortification of the dockyards. If London were placed in such a state of defence as to render an attack on it improbable by an enemy established on shore, even in such force as to be able to hold in check any army that could be brought against him ; an invader's attention would then be turned to the dockyards and arsenals, as by the destruction of these he might hope to annihilate the naval power of the country, and deprive it of further means of resistance. If, on the other hand, London cannot be rendered capable of resistance after the defeat of the army in the field, the dockyards and arsenals, if fortified, become places of refuge from which the defence of the country can be protracted or means of resistance organized; and unless these are capable of resistance, our naval means fall with the capital, and the whole power of the nation is practically in abeyance. Indeed, the fortification of the dockyards and arsenals by land would aid materially in the defence of London itself; for whilst by means of the system proposed, the vital points of the empire would be protected against either capture or bombardment, the fortifications by land would set the manoeuvring army free to operate against the enemy upon the coast, or upon his line of advance, in the same manner as the fortifications to seaward would set the fleet free to act with vigour and effect wherever required. Even if we suppose that the enemy had no intention of occupying the capital, or attempting a serious invasion of the country, he might still land a force with a sufficient supply of long-range guns and incendiary projectiles to burn one of the dockyards, before a force could be collected in sufficient numbers to oppose the attempt.

17. Your Commissioners are therefore persuaded that on every account the fortification of the dockyards and arsenals is essential, not only for maintaining our naval supremacy, but also for the security of the kingdom. It is not a necessity arising only out of recent improvements in warfare, nor one which future improvements can materially modify ; it is based upon considerations of universal application, which must exist while warfare itself is incident to nations. The mode of fortification must advance with the development of the means of attack ; but experience shows that it is less liable to fluctuation than almost any other element of defence.

18. The necessity for fortifying our important naval stations has at all times been recognized and acted upon, and at various times such works have been erected for their defence as were deemed sufficient to protect them against the means of attack that could then be brought against them.

During the last two years more especially, plans of fortification, involving an ultimate expenditure of about a million and a half sterling, have been sanctioned by Parliament for works of considerable extent at Portsmouth, Plymouth, Pembroke, and Portland; and contracts have accordingly been entered into for the construction of those defences, which are now in active progress, and to which we will more particularly refer when considering the defence of each of these places. In carrying out the duties entrusted to us, we have been guided by that passage of our instructions, which directs us to bear in mind, that the works now completed or in progress, or which had received Your Majesty's sanction, should be treated as part of any general scheme of defence which we may recommend; and we have only at present to observe, Without pledging ourselves to details, into which it has not been our province to inquire, even had time admitted of it, that we approve generally of the system of fortification adopted in the most recent works.

19. The protection of the dockyards against attack by sea, is obviously the first point for consideration; for in their present state an enemy might in the temporary absence of our fleet, or in the event of any contingency giving him command of the channel,

destroy any of these establishments without the necessity of landing upon our shores.

Of late years the application of steam power to ships-of-war, the introduction of vessels plated with iron, and the invention of artillery of longer range and more accurate aim, have rendered all defences designed for the earlier state of war incapable, without very extensive additions, of defending the places for the protection of which they were designed, and require the adoption of a style of sea defences suited to the present state of the science of naval warfare. The bombardment of Sweaborg, which took place before the two last-mentioned improvements were perfected, is sufficient to show how easily an arsenal strongly fortified, but without advanced works, may be entirely destroyed, even without the loss of a single man to the assailants; whilst, on the other hand, the impossibility of attacking Cronstadt was mainly due to the powerful advanced works which were constructed for its defence.

20. The nature of the works which we propose for defence against a naval attack, will of necessity vary according to the locality. We have proposed open batteries, secured against a coup-de-main by a tower or defensible barrack in their rear, wherever they could be made to answer the object desired; but where the sites were so circumscribed as not to afford sufficient space for the requisite amount of fire, and in cases where great expense must be incurred in constructing foundations on shoals, it is absolutely necessary that sea batteries should be casemated, so as to obtain by tiers of guns, as nearly as possible the same effect that is produced by open batteries extended over a considerable length of shore.

Great improvements have lately been adopted in the United States in the construction of casemated works for sea defence. Experiments have also been made in this country, and further trials are now in progress, for the purpose of arriving at the best possible form for the details of such works; and we have every reason to believe that the results will be highly satisfactory.

21. Your Commissioners have taken into consideration the expediency of constructing floating batteries, to aid the permanent fortifications in the defence of the more important positions. Such a mode of defence has been almost invariably referred to in the numerous schemes that have been proposed, from time to time, for the security of naval ports and arsenals, and has given rise to many conflicting opinions as to the circumstances under which they should be adopted, and the best method of constructing them. With a view to obtaining a solution of this question, and also to ascertain the most effective description of boom for obstructing the entrance to a harbour, we requested permission to appoint a committee of naval officers, in whose experience and judgment we could place reliance, for the purpose of fully inquiring into and reporting on these subjects.

This committee was formed under the presidency of Rear-Admiral Sir Thomas Maitland; and after careful inquiry and deliberation, in which they received assistance from several eminent shipbuilders, they transmitted their Report, which will be found in the Appendix.

22. The first point to which they turned their attention, was to determine the best mode of construction for a floating battery without motive power; it was supposed that such a vessel might be placed in an advantageous position at a time of expected attack, and that the guns might be worked by landsmen trained for that special purpose.

The committee have devised a battery of this description, combining the properties of a vessel and a raft, and possessing the various requisite qualities, more especially those of steadiness and light draft of water. The expense of such a battery would be considerably greater than that of a masonry work bearing the same armament, and would be by no means so efficient, on many grounds. Stationary floating batteries would not only be more expensive in the first instance, but would involve a considerable annual outlay for maintenance, and would require periodical renewal at certain intervals; they are liable to be sunk by the concentrated fire of or collision with large ships, the approach of which cannot be guarded against at high water, owing to the great rise of tide on the coast of England; they cannot, under any circumstances, afford a perfectly steady platform for accurate fire, such as is now more than ever indispensable with rifled ordnance; and they have not that advantage which is possessed by a casemated work, of affording good barrack accommodation.

Your Commissioners therefore do not recommend the adoption of stationary floating batteries of this description, under any circumstances.

23. The Committee have, however, also brought to our notice a far more perfect description of floating battery, which they conceive would be highly efficient for defensive purposes. It may be described as a powerful iron-sided steam-vessel, capable alike of maintaining a fixed station or manoeuvring in a general engagement, of sufficient size to afford a steady platform for working the guns, yet not so large as to be unmanageable in narrow waters; mounting from 12 to 20 guns, having a speed of from 8 to 10 knots, and of as light a draught of water as is consistent with other good qualities. Vessels similar in dimensions, armament, and general description to that which they have recommended would be, in some instances, most serviceable as auxiliaries to the permanent fortifications

for the defence of harbours and inner waters. They would be free from many of the objections to which the stationary floating battery is liable, and would possess far greater advantages.

Such vessels would be of great value during an attack, from their capability of moving to the assistance of any of the forts requiring support, of concentrating their force on an inferior portion of the enemy's fleet, or of preventing the escape of disabled ships, and destroying those that had run aground; they would be serviceable also in annoying the enemy while attempting to buoy the channel; the vessels themselves being enabled to avoid an attack of a superior force, by retreating into shoal water, to which the sea-going vessels of the enemy would be prevented from following them, owing to their greater draught of water.

Your Commissioners therefore recommend that measures should be concerted for the construction of vessels of this description for the special purpose of harbour defence, to be used in such positions as shall be hereafter specified. They should be divested of all qualities that are not necessary for this kind of service, in order to reduce the expense of building, and to prevent them from being detached on other duties. The iron-plated floating batteries already existing would co-operate with them, and would perform in a lesser degree many of the services required for harbour defence.

floating batteries are proposed as part of the permanent defence, irrespective of any number of gun-boats which may happen to be present. We do not consider these latter at all adapted to cope alone with the class of vessels which will certainly be employed in future naval attacks.

24. We submit that means might readily be found for providing these floating batteries with efficient crews at a time of expected attack, by appropriating for that purpose the officers and seamen of those ships that happen to be refitting or repairing in the port, the Naval Coast Volunteers in the vicinity, and others, who might otherwise be compelled to remain idle spectators, at a time when their services would be of the greatest value.

The Committee have also submitted various plans for booms or floating barriers suitable for different localities, which seem well adapted for the purpose for which they are devised. The circumstances under which we shall recommend their adoption, will be mentioned when treating of the defence of each port.

25. The next point for consideration is the defence of the dockyards and arsenals against an attack by land, which may be undertaken either with a view to effecting their destruction by bombardment, or for the purpose of actually capturing, and subsequently destroying them. In the former case, the operation might be attempted for that object alone, or it might form part of a plan for a general descent upon the country; but the latter attack, involving the necessity of a siege, could scarcely be undertaken except in connection with an invasion on a large scale.

It appears to Your Commissioners, therefore, that the first consideration, as regards the land defences, is to provide against a bombardment; the second, to secure the dockyards against capture.

26. As in the case of protection against bombardment by sea, so with respect to the defence against a similar kind of attack by land, the consideration of the necessary measures to effect the desired object, has become much more difficult of late, in consequence of the enormously increased range obtained by the newly-invented rifled ordnance; to meet which, we find generally that it is indispensable to occupy more advanced positions, than have heretofore been required for the effectual fortification of the dockyards; but in all instances we have been careful to avoid everything which did not appear essential to efficiency.

27. The general principles on which Your Commissioners have proceeded with reference to defence against long-range bombardment, are, that in cases where the nature of the country would admit of an enemy obtaining a full view of the dockyard within practicable range, which cannot now be estimated at less than 8,000 yards, it is necessary to establish defences, so as to command the ground within that limit; but wherever the dockyard is screened from view by hills, there is no necessity for occupying any position beyond the features of ground which afford such cover; for it cannot be supposed that an enemy would undertake an expedition involving risk, trouble, and great expense, for the sake of throwing shells into an establishment which he could not see, and of the effect upon which he could not, therefore, judge. We have been guided by the peculiar circumstances of each locality, with reference to the selection of the advanced positions of which we are now treating, and to the choice of less advanced defensive lines, to protect the dockyards and arsenals against capture.

28. It not being our province to consider the details of construction of the several works which we propose, we have confined ourselves to the determination of the positions which, in our opinion, should be occupied; the sites of the several works required; the extent of the individual works for each separate locality; and the consideration of the

general principles on which we conceive the works should be constructed.

With respect to this latter point, it appears to us that the works should be so designed, as to be defended by a small body of men against a coup-de-main ; but that they should at the same time have capabilities of resistance that will enable them to withstand any attack likely to be brought against them. With this view they should be provided with redoubts at their gorge, by means of which an enemy would be prevented from holding the work if he should succeed in obtaining partial possession of it. The main ramparts should be capable of affording a heavy fire of artillery and musketry, in those directions over which an enemy must make his approach; and bomb-proof cover should be provided for the garrison. In situations where the ditches can be filled with water, no revetment need be constructed; but wherever this is not the case, they should either have escarps and counterscarps or detached walls of masonry; and in either case they should be flanked both by artillery and musketry.

Your Commissioners do not take upon themselves to lay down the precise plan for each work, which will require much consideration in detail; but the foregoing are the leading principles which we conceive should be adopted, and they are those on which several of the works, now in course of construction at Portsmouth and Plymouth, have been designed.

29. The nature of the works contemplated has, in some respects, an important bearing upon that portion of our instructions, which refers to placing the dockyards and arsenals in a state of defence in as short a time as possible. In order to effect this, the design should be so contrived, that the main ramparts and ditches may be formed, without being delayed by the building of revetments or the construction of bombproof barracks and permanent magazines, which are all necessary to the completion of the defences. By this arrangement, a certain degree of protection, such as would be afforded by earthworks without revetments, could be obtained in three or four months from the commencement of the work, and guns could be mounted on these ramparts; subsequently the amount of defence would be increased, in proportion as the works progressed.

30. There will be no difficulty in obtaining contracts for excavations, to any extent that may be required; and, with the arrangement that we propose, such contracts might be put into operation immediately after the general designs shall be decided upon, and the land obtained. The building of escarp and counterscarp walls could be proceeded with, as soon as the excavations are sufficiently far advanced for that purpose; in the meanwhile the detailed drawings and specifications for all the building portions of the work might be prepared, and in three or four months from the time of commencement the whole might be in full operation.

Should circumstances render it necessary, the contractor would put his men in tents, while constructing huts for their accommodation. The contracts would, as is usually the case in Government works, be put out to competition; there can, therefore, be no doubt that the lowest market price of labour at the time would be obtained; and we do not conceive that, with the immense resources in labour possessed by this country, and considering the number of places at which the works will be carried on, and their great distance apart, the price would be materially enhanced by the demand, on account of the execution of the proposed works ; which bear no comparison in point of extent, with those which were carried on simultaneously during the earlier years of railway construction. Neither do we, for the same reasons, consider that the cost of materials, which will be about half that of the entire works, irrespective of the land, will be sensibly increased by the sudden demand, if the contracts are given out in a judicious manner.

31. A heavy item of expense in realizing the whole project of defence must be the acquisition of land. The entire quantity it is desirable to purchase amounts to about ten thousand five hundred acres, whilst the space actually occupied by the works will not exceed fifteen hundred acres; the remainder, which is indispensably necessary, in order to keep the land free from obstructions, may be considered as an addition to the national domain, the revenue derived from which may be assumed at about £25,000 per annum.

We have carefully considered the course we would recommend for obtaining the land; and have consulted on this, as well as on all other points connected with this part of our subject, with Messrs. Clutton, the well-known land surveyors. The result of our deliberations is, that it would unquestionably be advisable to proceed under the powers afforded by the Defence Act; by so doing, there is nothing to prevent the Government being placed in actual possession of what will be immediately required, in about a month, from the time of serving the requisite notice upon the proprietors.

Having regard to the position of the greater number of the sites proposed to be acquired, we have reason to believe that they will not require negotiation with many proprietors in each instance; but should it be otherwise, that circumstance will not in our opinion materially affect the obtaining possession of the land under the Defence Act; nor do we consider that this course of procedure would tend to greater expenditure than if the land were obtained by the usual mode of negotiation. Indeed,

we are informed by officers in the War Office, who are conversant with these matters, that it is better to put the Defence Act into operation in every case; it having been found that, under other modes of proceeding, proprietors are enabled to make reservations to suit their private convenience, which, although they may appear unimportant at the time, subsequently prove injurious to the interests of the Government, by limiting its power over its own property. We would add, that although a notice is served upon a proprietor under the Act, the purchase may, nevertheless, be settled between two surveyors; should they not agree, recourse can be had to arbitration, or the decision of a jury.

As regards the estimated expense of carrying out our recommendations with respect to the land, we have adopted the valuation of Mr. Clutton, who has been employed by us for the purpose of making the necessary inquiries on the subject. The estimated cost of the several works of fortification, has been based upon the experience which the Royal Engineers have obtained, in the erection of works similar to those which it is now proposed to construct.

Without detailed plans, such estimates can only be considered as approximative; but we have every reason to believe that the amount stated will be found sufficient for the purpose. Although the total is large, we have come to the conclusion that the expenditure of such a sum is indispensable for the security of our dockyards and arsenals; and that, if spent in the manner we recommend, the result will be much more effectual for the permanent defence of the country, and far more economical, than any other method of effecting that object.

33. It may be desirable that we give some idea of the time that would be required for the execution of the works we recommend, and consequently of the financial arrangements that should be made, to meet the necessary payments, if their construction be authorized. That part of our instructions which directs us to treat works which have already received Your Majesty's sanction, as part of any general scheme which we may recommend, requires us to include in our estimate of expense about one million and a half that has been already submitted to Parliament.

34. As regards the estimate for the floating batteries, which we have proposed in certain cases in aid of the sea defences, we will, without entering into the details of the question, refer to the Report of the Committee appointed to consider that subject; and, taking the estimate of the expense of each vessel therein proposed as a basis, we recommend that a sum of one million should be appropriated for this purpose, which would provide a force of about 200 guns.

35. The amount of our special estimate is £10,390,000; of which sum £1,885,000 is for the purchase of land, £7,005,000 for the fortifications we recommend for erection, £500,000 for the armament of works, as shown below (Sec. 39.), and £1,000,000 for floating defences. To this must be added £1,460,000 for works already sanctioned, and in course of execution; the whole amounting to £11,850,000 as detailed below.

Place	Recommendations of the Royal Commission		Already authorized, but not voted	Total
	Purchase of Land	Erection of Works		
	£	£	£	£
Portsmouth	330,000	2,070,000	400,000	2,800,000
Plymouth	755,000	1,915,000	350,000	3,020,000
Pembroke	150,000	450,000	165,000	765,000
Portland	100,000	150,000	380,000	630,000
Thames	} 50,000	{ 180,000	Nil	180,000
Medway and Sheerness		{ 400,000	Nil	450,000
Chatham	180,000	1,170,000	Nil	1,350,000
Woolwich	300,000	400,000	Nil	700,000
Dover	20,000	150,000	165,000	335,000
Cork		120,000	Nil	120,000
Armament of Works				500,000
floating Defences				1,000,000
Total	1,885,000	7,005,000	1,460,000	11,850,000

It is to be observed that the above sum includes the provision of barrack accommodation, for the most part bomb-proof, for about 30,000 men, with all the space and conveniences provided for troops under ordinary arrangements; and for nearly double that number when the works are fully garrisoned for defence. This accommodation must have been equally provided under any other system of defence, and is already urgently required in many of the places it is proposed to fortify.

36. Judging from works for which contracts are already undertaken, those which Your Commissioners recommend may very well be executed in three years; but it would be

We recommend that the regulations for the instruction of the Infantry of the Line, and Militia, in the service of garrison artillery be particularly enforced, as the importance of such training will be greater than ever, and that measures be adopted for the organization of Local Militia Artillery, and for the encouragement of Volunteer Artillery Corps in the neighbourhood of all fortified places.

39. We submit that the above measures would suffice for the artillery portion of the force required; and as regards the entire garrison of the various fortified positions, we have before referred to the advantages which fortifications afford of utilizing the large bodies of irregular troops which, from the experience of the last few months, we may with confidence rely on as being available during war. Those portions of the volunteer riflemen and the militia which are not sufficiently trained to be capable of manoeuvring in the field, will be valuable auxiliaries for the defence of the works, and, combined with the pensioners and a proportion of regular troops, will form a body that may be depended upon for the garrisons of permanent fortifications.

If the measures above recommended are resorted to, Your Commissioners foresee no difficulty in providing efficient garrisons for the works they have proposed, by the time they are completed.

40. The new works recommended to be undertaken, involving the provision of extensive armaments and large artillery equipments, we have directed our inquiries to the means of providing them, and the extent of the existing store. In respect to expense, that portion which is not provided for in Engineer estimates, appears to amount to about £167 per 68-pounder smooth-bored gun, and is less for the smaller natures. We are not prepared to say precisely how many guns should be placed in some of the proposed new works of land defence. This will depend upon the nature of the work in each case, and is a detail to be hereafter arranged between the proper departments. Upon a general estimate, however, we are led to believe that the works herein proposed will require for armament, not less than 2,500 pieces of artillery, in addition to any that are now mounted, or already demanded for works which have been sanctioned previous to this Report. Taking these at an average of £200 each, on the supposition that a portion of them will be rifled ordnance, the estimated expense under this head, will be £500,000.

41. We are led to conclude that there will be no difficulty in arranging for the provision of such a number of pieces in addition to other demands within the next three or four years, the time which we estimate to elapse before the works can be ready for their reception; but the provision of the gun carriages, traversing platforms, and other necessary equipments will not be unattended with difficulty, and may overtask the resources of the Royal Arsenal, great as they are. It is therefore our duty to submit that private manufacturers should if necessary be resorted to, (although it does not appear to be the usual practice in regard to these articles,) in order that all necessary equipments may advance *pari passu* with the progress of the works for which they are intended. We have received returns by which it appears that there is virtually no store of gun carriages in excess of the actual appropriations, and a very inconsiderable one of those particular natures of guns which it is desirable to introduce into new armaments. There is a large store of other natures of ordnance, chiefly obsolete, and for which carriages are no longer kept on hand; and although we are aware of the greater cost of guns than of carriages, it would in our opinion be preferable to make new guns and new carriages altogether, than to prepare new carriages for ordnance which are rapidly going out of use.

42. It is necessary to state, that the approximate total increase of guns given above, is calculated upon the supposition that every sea battery and isolated work has its armament at all times complete; not necessarily all mounted, unless the gun carriages are protected by casemates; but all on the spot. With respect to works of land defence which mutually support one another, such as those with which it is proposed to surround Portsmouth, Plymouth, and Chatham, we conceive that the following principles should be adhered to :-

1. That each work should have its principal salients and flanks partially armed, even during peace; a very few guns will suffice for this purpose.
2. That there should be in reserve in each work, but not mounted, unless the perishable carriages and platforms will be under cover, as many more guns and carriages as will extend the protection of the flanks and faces to what we would term a war armament, as distinguished from a siege armament.
3. Lastly, that there be a general reserve, in some convenient central depot in each position, of a further number of guns and carriages sufficient to complete the armament of any one of the fronts of attack to its maximum or siege establishment, together with the proper proportion of every description of store to effect repairs and replace casualties.

The magazine accommodation, the provision of store-room, and the conveniences for

filling shells and fixing fuzes, should be calculated generally for the siege armament.

43. Our attention has been called to the employment of vertical fire against shipping, as an auxiliary to horizontal fire, and as being, with all its confessed disadvantages of want of accuracy, the most likely description of fire to be effective against stationary iron-sided vessels, at moderate distances. We have had before us a Report on this subject, lately addressed to the Secretary of State for War by Colonel Lefroy, Royal Artillery, and Lieutenant-Colonel Owen, Royal Engineers, in which it is shown that the percentage of mortar shells which may be thrown upon the deck of a vessel at anchor up to 700 yards is far from inconsiderable; and considering the very destructive effects of large shells bursting in the hold or between the decks of a vessel, we are of opinion that mortars should enter much more largely into the armament of our sea defences than is at present the case.

44. We are well aware of the uncertainty which attaches to the flight of rockets; but considering the comparatively small expense of this weapon, the facility with which it can be used, and the little exposure of the men, we are of opinion that large rockets should be provided for situations favourable to their use, such as the passage of narrow channels, and the protection of landing places; and that the smaller natures may be employed for the defence of ditches in the proposed land defences.

45. The proportion of thoroughly trained and skillful artillerymen required for coast defences appear to depend, to some extent, upon whether the guns are intended to fire shot or shells; the latter, used with time fuzes, as is customary in the land service, require one or two skilled men per gun more than the former, which is not the case when they are used with percussion fuzes; and as there is no doubt that percussion shells are the most effective against shipping, we are of opinion that they should enter largely into all provision of ammunition for coast defence. Our inquiries lead us to conclude that they are seldom, if ever, issued for such purposes at present.

46. Notwithstanding the very large store of 24-pounder, and 32-pounders, which is shown in Appendix 12 (not included in the printed copy of Report), we have found obsolete 6-pounders, 9-pounders, 18-pounders, 24-pounder or 5 1/2 inch iron howitzers, and 12-pounder carronades, either actually mounted, or if dismounted, borne as a part of the actual armament of works in important positions, such as Dover and Plymouth; creating a great multiplication of calibres, as well as occupying the room of more effective pieces.

We have also found on inquiry that Shrapnel and common shells of patterns now obsolete still enter into the armaments of many of our most important coast defences.

47. We have taken every opportunity in the course of our inquiries to visit existing works of defence, and deem it our duty to call attention to particulars in which several of them have appeared to us susceptible of being improved. We have been struck with the very general want of cover in all batteries except those of the most recent construction: traverses are urgently wanted in most of them, and it would frequently be expedient to supply them at the sacrifice of a gun for each traverse. A battery of eight guns, for example, thus protected, would be far more serviceable than one of ten guns without traverses, which is open to enfilade, or to the destructive effect of shells thrown into it. The effect of shot upon loose shingle, which abounds before some of the batteries, was shown by experiments which we requested to have made, contrary to a general impression, to be quite insignificant; but there are instances in which guns are placed so immediately in front of masonry scarps that we apprehend great danger from the effect of shells bursting against them; and recommend the attention of the Royal Engineer Department to this subject, with a view to a change of position for these guns, or some other remedy.

With these preliminary remarks, your Commissioners will now proceed to consider the works of defence which are necessary at each of the places specified in our instructions.

PORTSMOUTH

48. The defence of Portsmouth Dockyard and Harbour, as also of the fine roadstead of Spithead, against attack or occupation by an enemy, has ever been considered an object of primary importance; and while the improvement of implements of warfare has rendered it more difficult of attainment, it becomes at the same time a more immediate necessity.

The dockyard is the most important establishment of that description in the United Kingdom, not only as regards its capability for building, repairing, and refitting ships of war, and the vast amount of stores of every denomination accumulated there for the service of the fleet; but also from its central position on the South Coast of England.

49. The capacious anchorage of Spithead becomes of peculiar importance in time of war. In the words of Vice Admiral Sir R. Dundas, "Under any circumstances, and considering the importance of Spithead as an anchorage, and as a place of refit for our fleets, without reference to Portsmouth as a military position, no pains should be spared to render it secure from attack, not only by an enemy in force, but from desultory attacks by

powerful cruisers, which in its present state would often be perfectly practicable, under steam. It should be borne in mind that in all former wars, Spithead has been used as a perfectly secure rendezvous for a fleet; receiving ships, sheer-hulks, and many other appliances for refit have been stationed there; caulking and other extensive repairs by shipwrights, artificers, and riggers have been carried on at Spithead; and no ships used ever to be allowed to proceed into harbour, merely for victualling and watering, or completing the ordinary supplies of stores and ammunition. All these operations will still require to be performed at Spithead, in addition to coaling, which will henceforth be not less important. Convoys of more than a hundred sail of merchant vessels at a time, have been assembled at Spithead; and when all these circumstances are considered, it appears that the secure use of that anchorage, or at least of some portion of the space within the Isle of Wight, for the purposes above referred to, must be a matter of scarcely less importance than the security of the naval arsenal itself."

50. In addition to the value of Portsmouth as a naval station, it occupies a strategical position of considerable importance in case of invasion; lying as it would upon the flank of an enemy advancing upon London, either from the southward or south-westward, and consequently obliging him to detach a portion of his army, to prevent the garrison acting upon his communications.

51. We will consider, first, the sea defences ; second, the land defences.

The sea defences of Portsmouth may be classed under five heads :-

1st. For the immediate defence of the entrance to the harbour, to prevent an enemy running his fleet in, and destroying the dockyard and shipping.

2nd. To prevent an enemy obtaining a footing upon any part of the shore within the fortified positions to landward, between Brown Down and Fort Cumberland; and effecting the destruction of the naval establishments by a force landed for that object.

3rd. The protection of the anchorage at Spithead ; and that of the dockyard against bombardment by sea.

4th. The defence of the Needles Passage.

5th; To prevent an enemy obtaining a footing upon the Isle of Wight.

52. As regards the first head; the existing batteries at Blockhouse Fort, the Point Battery, and the batteries connected with the right of the old Portsmouth Lines, together with Southsea Castle, provide for the defence of the immediate entrance to the harbour; and, considering the difficult nature of the channel, little, in addition is requisite to render it secure.

We have only to recommend that, at Southsea Castle which is in a most important position, raking the approach, additional batteries should be placed connecting the present auxiliary batteries with that work, and that at a time of expected attack, some obstacle in the form of a floating barrier, should, be moored across the entrance of the harbour.

53. With respect to the second head, the points requiring attention are, first, to prevent an enemy landing on Portsea Island; second, the defence of the shore of Stokes Bay, and between Gilkicker Point and Blockhouse Fort.

The first case is already partly provided against by Southsea Castle and Fort Cumberland. The latter is a work of considerable extent, defending the mouth of Langston Harbour, and is well adapted to prevent the passage of an enemy from seaward to the eastern side of the island, between it and Hilsea Lines. This fort also co-operates with Southsea Castle in sweeping the intervening beach, whilst the interval between these works, distant about 4,000 yards, is about to be taken up by two heavy batteries bearing to seaward, and flanking the shore. One of these, called Lumps Fort, is already in progress. The other, at Eastney (not yet commenced) will be in connection with a barrack for 1,000 men, which is to be constructed for the marine artillery, and will form a defensible post for the troops employed in opposing a landing.

We recommend that Cumberland Fort should be fully armed : but no additional works are required to provide against a landing between Southsea Castle and the entrance to the harbour. A road, covered by a parapet to seaward, should, however, be made along the shore, connecting the works between Southsea Castle and Cumberland Fort.

54. As regards a landing in Stokes Bay; a line of rampart and wet ditch, well flanked, is already in progress, connecting the left flank of the land defences in front of Gosport with Fort Monckton near Gilkicker Point; and sanction has been already given for the construction of a small work to give additional security behind the centre of the line, which is about 2,300 yards long.

Between Gilkicker Point and the entrance to the harbour, the line of shore is under

the fire of Fort Monckton, Blockhouse Fort, the Point Battery, and the guns on the right flank of the Portsmouth Lines. We do not consider that any additional defences are requisite in this quarter.

On the whole, therefore, we are of opinion that the works already in existence, in progress, and projected, with the small additions we have specified, will fully suffice for the defence of the line of coast between Fort Cumberland, and the left of the advanced position in front of Gosport.

55. As regards the third head; the protection of the anchorage at Spithead and the Defence of defence of the dockyard against bombardment by sea, are intimately connected with one another, and the works which would meet the one object will also provide for the other.

They are both of such immense importance, and at the same time so difficult to accomplish, that we have deemed it necessary to take the opinion of several officers who are peculiarly capable of forming a correct judgment on the subject. The views of Vice-Admiral the Honourable Sir R. Dundas, of Rear-Admiral Sir T. Maitland, of Captain Sullivan, R.N., and of Captain Hewlett, R.N., are given at length in their evidence, which is well worthy of attention.

On examining the chart of Spithead, it is evident that the existing defences would not suffice to protect either the dockyard or the anchorage, against attack by an enemy's fleet in the present day. We have received evidence from high authorities, and we are ourselves persuaded of the fact, that a mass of buildings occupying such an area, and containing such combustible materials as abound, in Portsmouth Dockyard, can be set on fire and almost entirely destroyed by rifled ordnance, at a distance of 8,000 yards. An enemy's flotilla of small vessels, armed with rifled guns, might occupy Spithead and the Horse Sand, and without approaching nearer than 3,000 yards to any of the existing works, could bombard the dockyard with comparative impunity. Such vessels would offer so small a mark at that distance, that even the accuracy of the newly invented rifled ordnance could not be depended on for striking them; but when it is considered that each will be in motion, and that it will be impossible to estimate correctly their distance, thus continually varying, it may fairly be assumed that they would incur but little risk in such an attack. Nor would any protection, against an attack of this nature, be afforded by the removal of the buoys and light-ships, for, by careful attention to the soundings, ships skilfully commanded can be taken wherever there is sufficient water for them, provided they are unopposed. We are strongly confirmed in this opinion by the experience of our naval officers who served in the Baltic during the late Russian war.

56. To provide against such a contingency, it has already been proposed to construct works of defence on the shoals at No-Man's-Land and the Horse Sand, where the main channel narrows to about 2,000 yards in width. It has been also under the consideration of the authorities, whether additional defences should not be constructed between the Horse Sand and Portsea Island, and between No-Man's-Land and the Isle of Wight: the object being to bring a cross fire to bear on the whole space between Portsea Island and the Isle of Wight, and so to close the passage against an enemy.

We are, however, convinced that no practicable amount of fire from batteries, can be depended upon to stop the passage of steam ships, if the channel be sufficiently clear to allow of their proceeding at great speed.

On the other hand, there is no reasonable probability of a fleet attempting such a passage, unless it can, by continuing its course, arrive at a space where it would be comparatively unmolested, and be free to carry out some object of importance, such as the destruction of a fleet or of a dockyard.

57. It appeared to us, then, in the first instance, that the most effectual means of guarding against such an attack would be completely to close the entrance to Spithead against the ships of the enemy, by constructing a permanent barrier across the Horse Sand, between the Horse Buoy and Cumberland Fort; and placing a boom or other floating obstruction across the channel between the proposed forts on No-Man's-Land and the Horse Sand; but, after giving the fullest consideration to the practicability of this scheme, we have arrived at the conclusion that the permanent barrier is unadvisable, owing to the many difficulties of construction that present themselves, and the objections to its being placed in such a position. The great rise and fall of tide render it imperative that it should be carried up many feet above low water; and the heavy swell that sets in with a south-east gale would break on it with such violence, that nothing but a costly and substantial breakwater would be durable; it would likewise offer obstruction to the navigation of small vessels in time of peace, besides incurring a risk, the amount and nature of which cannot be foreseen, of affecting the form of neighbouring shoals and the channel leading into Portsmouth Harbour. The barrier at Cronstadt will no doubt be thought of in reference to these remarks, and we only allude to it for the purpose of observing, that the circumstances under which it was constructed, differed entirely from those in the case now under consideration. The position in which it was there placed was sheltered from the violence of the sea, and did not incur the necessity of continuing it above the level of the water, as there is but

little rise or fall of tide in that locality. Peculiar facilities were afforded for its construction in the winter, by the ice which formed over the whole space.

58. Without a barrier over this shoal, it is evident that a boom across the channel would be practically useless. We therefore directed our attention to the best means of bringing a heavy fire to bear on every point from which the dockyard could be bombarded, and recommend accordingly that the casemated forts, which it has been already proposed to construct on the Horse Sand and No-Man's-Land Shoals, be proceeded with: also that a work should be constructed between that on the Horse Sand and Portsea Island; another on the Spit Sand; and a fifth casemated fort on the Sturbridge Shoal; the form of the latter to be regulated by the site, which is less favourable than the others; lastly, that batteries should be placed upon the shore of the Isle of Wight, near Nettleson Point and Appley House, to support the works on No-Man's-Land and the Sturbridge Shoal respectively on their southern sides.

59. Owing to the great extent of the anchorage and the position of the shoals, the five forts first mentioned, must necessarily be placed at considerable distances from each other, and at high-water they will be open to attack by large ships approaching within point-blank range. Any objection that may arise owing to the great intervals between the works will, to a great extent, be obviated by the use of the Armstrong gun, the great accuracy and power of penetration of which, render it effective against ships at a considerably greater distance than the ordinary smooth-bored gun. The power that an enemy would have of anchoring large ships close to the works can only be met by constructing them of large dimensions, and aiming them powerfully in every direction on which they are assailable, which, in the case of the three principal works, would be, at high water, equally on all sides. Such an attack, however, would not be made simultaneously; the enemy could not, without endangering his own ships, bring his fire to bear on more than one half of the circumference of each work at one time; the garrison of a work so situated, therefore, need not be in proportion to the entire armament.

With this object, Your Commissioners recommend that the more important of these works should be built with three tiers of guns in casemate, with guns and mortars on the roof. The adoption of such a mode of construction will add considerably to the amount of fire that can be brought to bear on any point, and will give the upper tier of guns command over the decks of the attacking ships, an advantage which will be obtained at a comparatively small addition to the total cost of the work, when the foundations have been completed. These batteries should be built of masonry, faced with hard granite; the embrasures should be of wrought iron, and of as small dimensions as possible, compatible with the free working of a gun.

60. These proposed works, together with those existing and in progress, viz, Fort Cumberland, Southsea Castle, and the intervening batteries at Lumps and Eastney, Fort Monckton, the batteries on the Stokes Bay line, and that on Gilkicker Point, which latter should be extended and strengthened, would effectually command the anchorage, and prevent an enemy's fleet from occupying any position from whence a bombardment of the dockyard could be attempted, without previously silencing two or more of the principal works.

The positions of the several works, and their bearing upon the attack, will be seen by reference to the chart attached to this Report.

61. After having given the most thorough consideration to this question, we are of opinion that nothing short of the project now proposed will meet the necessities of the case; and as an example illustrating the expediency of it, we would refer to the sea-defences of Cronstadt, where the allied fleets of England and France were, for two years, deterred from making any attempt either to capture or bombard the place, or to destroy the fleet of Russia, chiefly owing to the foresight that nation had shown in constructing, during a long peace, a formidable and extensive system of fortifications, consisting of powerful casemated batteries of a somewhat similar construction to those which we now propose.

62. We now proceed to consider the defence of the Needles Passage.

The part of the channel which offers the greatest facility for defence, is that where a narrow tongue of land projects from the mainland towards the Isle of Wight, reducing the breadth of the passage to 1,400 yards; through this channel the tide runs with great velocity; an enemy's fleet therefore advancing with the flood would derive great assistance in passing it rapidly.

63. There are already in existence three forts which bear upon the passage, viz., on the north shore, Hurst Castle, an old work constructed in the time of Henry VIII, on either flank of which earthen batteries were placed about seven years ago; on the southern shore, Fort Victoria, at Sconce Point, and a casemated work at Cliff End, both works of more modern, and we must add, with respect to the former, not of the most approved construction.

As before observed, we do not consider that any amount of fire which it would be practicable to bring to bear upon a channel such as this would prevent steamers from running through, provided there were any sufficient object to be attained, and that the officers in command were determined on risking the loss which they would probably sustain in the attempt.

In the present instance the principal object of an enemy would be either the destruction of our ships at Spithead, or an attack upon the dockyard; but these attempts would be impracticable if the works above proposed were constructed at Spithead; and we are therefore led to consider whether any other inducement would remain for an enemy to risk the passage of the Needles.

64. We do not conceive that it would be a sufficient object to run up the Solent or Southampton Water, to burn the merchant shipping there, for he might, if so disposed, attack commercial ports of greater importance elsewhere, without so great a risk as that of running the gauntlet at the Needles.

Neither do we think that he would, unless he had previously attacked and silenced the batteries for its defence, push through the passage with a view to landing troops for attack upon the land defences of Portsmouth, or on the Isle of Wight; which would be an operation of time and difficulty, and requiring several repetitions of the exploit.

We arrive then at the conclusion, that if the fire upon the Needles Passage be made so heavy as to cripple an enemy's squadron in effecting the passage, it is not likely that this attempt would be made.

65. We do not consider that the fire of the existing works is sufficient for that object and therefore recommend that additional guns be placed behind earthen parapets along the height behind and on either side of Cliff End. We also recommend that a battery be placed at the point between Totland and Coldwell Bays, and that batteries should be constructed at Hatherwood Point and near the Needles Point, the two latter to bear on Alum Bay, as well as to afford a fire upon "the Bridge" at which part of the channel the navigation is difficult for large ships.

66. With respect to the works at Hurst Castle, the guns in the existing open batteries are so low, and are consequently so much exposed to the fire of ships, which can pass quite close to them, within the ordinary range of grape shot, that we think it would be desirable to construct casemated batteries in lieu of them. In addition to the advantage of securing the guns from the effect of the enemy's fire to the front, the casemates would effectually cover them against an enfilading fire, to which they are new peculiarly subject; they will also afford accommodation for troops; and another tier of guns can be placed on their roof, by adding only in a very small degree to the cost of the works. It should be remarked, that there is a channel for gunboats and vessels of light draught of water close to the beach on the western side of Hurst Castle, and it is therefore of importance that a portion of the guns of the work should be directed so as to bear upon this approach.

67. We do not propose that any further sea batteries should be constructed to bear upon the Needles Channel, beyond those just specified; but in order to prevent the works on the southern shore from being taken in reverse by an enemy, who may have obtained a footing on the Isle of Wight, we are of opinion that a fort, which should contain the necessary barrack accommodation for the men to work the additional guns which we have recommended, should be placed on a central point between Cliff End and Freshwater. This fort, which should be complete in itself, would act as a support to the whole of the batteries from Sconce Point to the Needles inclusive, and, in conjunction with the existing redoubt at Freshwater Gate, would command the approaches, to this part of the island from the eastward; the Yar River being impassable at low water between Freshwater Church and Yarmouth;

Your Commissioners consider that a few vessels of that description which they have recommended for harbour defence, would form a valuable auxiliary to whatever portion of the sea defences may be threatened with attack; they would effectually prevent such a partial bombardment of the dockyard as might be attempted by the small vessels of the enemy, while the larger ships were engaged with the batteries; and they would, at all times, be able to retreat under the protection of the batteries, when in danger of being overpowered by a superior force.

68. In connection with the sea defences of Portsmouth, it is of importance to consider the necessary measures to prevent the landing of an enemy on the Isle of Wight. It is evident that if an enemy had succeeded in establishing himself upon this island, he could prevent our making use of the anchorages of Spithead and the Solent. We therefore consider that its security against hostile occupation forms a most important element of defence.

With the works that have been proposed at Spithead and the Needles, the northern

part of the island would, we consider, be protected against the landing of a hostile force; it only remains, therefore, to take into consideration the defence of the coast from the Needles round by St. Catherine's to Nettlestone Point, which is opposite to the proposed work on No-Man's-Land.

69. The batteries already proposed will provide for the defence of Coldwell, Totland and Alum Bays, between Cliff End and the Needles Point; from the latter to Freshwater Gate the cliffs are high and inaccessible.

A landing might be effected in Freshwater Bay or in Compton Bay, if unopposed; but we consider that the existing redoubt which commands this part of the coast is sufficient to provide against this contingency.

70. On the south-west of the island there are some places at which an enemy might land a small force in fine weather; but the cliffs at these points are generally inaccessible, except at certain spots, such as Brook Chine, Chilton Chine, and Grange Chine, where there are small openings in the rocks affording access to roads communicating with the interior.

We recommend for the defence of this part of the shore, that two towers should be constructed, one near Brook, the other in the Vicinity of Brixton, to act as supports to field artillery and infantry engaged in opposing a landing; and further, that a battery with a keep in its rear, containing the requisite accommodation for men, stores, &c., should be placed between Chale and Brixton Bays on Atherfield Point, which is well situated for affording a fire upon the offing, and for flanking the beach on either side, where the landing is comparatively easy; more especially in Chale Bay, where ships can approach close to the land, there being five fathoms of water at a distance of only 400 yards from the shore.

A permanent road should be constructed along the top of the cliffs between Chale and Compton Grange, near Brook, to allow of field guns being brought to bear on any particular point that might be threatened; emplacements for artillery should also be formed, from whence the several landing-places might be commanded. The paths up the Chines should be destroyed in case of expected attack.

71. Between Blackgang and Luccombe Chines is the Undercliff, a tract of land about half a mile wide, bounded on the land side by cliffs from 100 to 400 feet in height, through which there are but few openings. The shore is rocky, but there are landing-places, of small extent, during two or three hours every tide, at Ventnor Cove, at two small coves near St. Lawrence, at Puckaster Cove and Reeth Bay. If troops were to land on this portion of the coast, they would still have to pass the upper range of cliff, through which the only openings are at Luccombe, Ventnor, St. Lawrence, and Blackgang; considering the strength of this position, and the facility with which access by the openings might be cut off, it is not considered necessary to provide any permanent works for its defence.

It would, however, be desirable to station a battery of field artillery near St. Lawrence, and a half-battery near Shanklin; the latter to be brought down to any point of the shore between Luccombe and Sandown Bay, where there are three or four places by which an enemy might pass through the cliff, provided he were unopposed.

72. Sandown Bay affords the best and indeed the only good landing-place for an enemy on the whole of that part of the island between the Needles and Spithead to the southward. The beach here, which is sandy, and generally clear of rock, is about 2,000 yards in extent, 600 yards of which is available for landing at all times of tide, whilst there are five fathoms at low water within 550 yards of the shore.

There is in existence for the protection of this bay an old bastioned fort, which is now very much out of repair, and is only provided with a stone parapet four feet thick. We recommend that a new permanent work, secure against a coup-de-main should be substituted for this, and that batteries, secured by keeps in their rear, should be placed, one on the rising ground near Yaverland, another on a projecting point near Landguard, and a third at a point below Sandown Barracks, so as to flank the beach.

It is advisable that the three latter works should be constructed, before any steps are taken towards the removal of the old fort in the centre of the bay, which we consider should meanwhile be made available to afford some protection to this portion of the coast, by providing it with an earthen parapet, armed with heavy guns bearing to seaward; on either side of the work should be placed permanent batteries of about five guns each, bearing on the offing and flanking the beach.

The works at the eastern side of the bay would, however, be subject to be taken in reverse from Bembridge Down, if a small force of the enemy succeeded in landing at White Cliff Bay; it is therefore necessary to occupy the summit of the down by a tower, which would also be of considerable value to cut off the access of any force, which might have gained a footing on the shore of the peninsula, between Brading Harbour and White Cliff Bay.

73. The only other permanent work which Your Commissioners think necessary for the defence of the Isle of Wight, is a battery, with a keep in its rear, at St. Helen's Point, to oppose any attempt to get on shore between Bembridge and Nettlestone Point.

74. We are of opinion that the existing battery at Yarmouth, which, under the proposed arrangements, can take no part in the defence of the island, should be dismantled.

75. We now proceed to consider the defence of Portsmouth Dockyard and Harbour against an enemy landed in the country.

It will be clear, on inspection of the map, that so long as the proposed defences of the eastern entrance to Spithead, and of the Needles Passage, are in our possession, an enemy, in order to attack Portsmouth by land, must effect his disembarkation either to the westward of the latter, or to the eastward of Langston Harbour, the entrance to which is defended by Fort Cumberland.

The plan of an enemy might be either to attack Portsmouth before he advanced on London, or, if he had a sufficient force, to detach a portion of his army to destroy the dockyard, at the same time that his main body marched on the capital.

In either case the chief part of his force would occupy the attention of our manoeuvring army covering London, and that army would not, therefore, be available for the immediate defence of the place, which must consequently be left to its own resources at the time.

A land attack might be made upon Portsmouth, either with a view to its actual capture or to its destruction by bombardment.

It is submitted, that although by its capture the enemy would do an immense amount of injury which he could not effect by bombardment, yet that the latter mode of attack is the most probable, for it could be carried out with comparative rapidity, with much less risk, and with a much smaller force than would be required for an actual siege, which would be necessary to effect the capture; it is possible, indeed, that a bombardment might be attempted, as an operation by itself, without reference to a general invasion of the country.

76. With a view to secure Portsmouth from capture by land, lines of defence have been constructed at different times during the last two centuries; those immediately covering the dockyard and town were commenced in the reign of James II., and were continued at intervals until near the end of the last century, when the works at Portsea were completed. The earthworks and wet ditch on the Gosport side, enclosing the victualling yard, were constructed about the year 1678, and were extended to Priddy's Hard about 1790. .

These lines have long been considered a most inefficient protection, not only on account of the limited space enclosed by them, and the obstruction caused by the spread of buildings round them: but also on account of their having no influence whatever in protecting the naval establishments and harbour from bombardment.

We are nevertheless of opinion, that as these works exist, they ought to be maintained in a state of efficiency, to protect the naval establishment from capture in the event of an enemy forcing a landing in their immediate neighbourhood; and we recommend that the right of the Portsea Lines, which is now open, should be closed by being joined to the left of the Town Mount Bastion of the Portsmouth Lines, and that when this is done, all the fortifications from that bastion round to King James's Gate should be removed. This would add considerably to the strength of the lines, and the expense would be insignificant as compared with the value of the land, above 37 acres, which would thus be enclosed by the fortifications and rendered available for the extension of the Government establishments.

The only advanced works which were constructed for the defence of Portsmouth, until within the last few years, were some earthwork lines of weak trace and low profile on the north shore of Portsea Island, behind the channel between Portsmouth and Langston Harbours. There was a fort also on the same ground in the time of Charles the Second, to defend the passage across that channel, and so cut off an enemy from that means of access to Portsmouth.

During the last seven years, two works have been constructed in advance of the old Gosport lines, on the peninsula between the harbour and the Solent, and at a distance of about 4,000 yards from the dockyard. One of these, Gomer Fort, near Brown Down, is already completed; and the other, Elson Fort, behind Bedenham Creek, on the harbour side of the peninsula, is nearly finished.

77. Two years ago, a plan was approved by the Government, for the completion of the land defences on a scale suited to the importance of the object, but not having reference

to the range of the present rifled artillery, which at that time had not been introduced.

This plan provided:

1. For placing three powerful works, with wet ditches and keeps at their gorge, between the forts at Gomer and Elson, and for connecting the five works (the intervals between them severally being about 700 yards) by earthwork lines of ditch and parapet.
2. For throwing up strong lines behind the Hilsea Channel, in lieu of the insignificant fieldworks then existing, taking advantage of the construction of the new works to widen and deepen the channel, the improvement of which was much desired by the Admiralty.
3. For the construction of two forts in rear of Hilsea Lines, to act as keeps to the position.
4. For a work on Horsea Island, to prevent an enemy establishing himself thereon, and to aid in the defence of Hilsea Lines.
5. For a work in front of Porchester Castle, to prevent the enemy bombarding the dockyard from that point.
6. The project also provided for the line of works along Stokes Bay, and batteries between Southsea Castle and Fort Cumberland, before alluded to, in speaking of the sea defences.

We do not here enter into the details of this project, as a memorandum relating thereto, which was drawn up at the time the plan was prepared, will be found in the Appendix; but we may observe, that we consider the plan was well adapted for its object at the time, and we approve of the works in course of construction under the two first items, for which Parliament voted a sum in the estimates for the last and present years. No step has been taken towards carrying into effect items 3, 4, and 5, for reasons which will subsequently appear.

78. When last year the introduction of rifled ordnance created such a revolution in the practice of artillery, a committee was appointed by the late Secretary of State for War to consider what effect the Armstrong Gun would have upon works of fortification then in progress, and the question as to the influence it would have upon the works then in course of construction at Portsmouth, was narrowly discussed.

The report of that committee, of which H.R.H. the General Commanding in Chief was president, and the Inspector General of Fortifications one of the members, will be found in Appendix 4.

The Committee came to the conclusion, that all that had been done up to that time would turn to good account; but that it would be advisable to dispense with the works included in items 3, 4, and 5, before referred to. In that opinion we quite concur.

Items 3 and 4 are unnecessary, for the additional strength that Hilsea Lines would derive from those forts will be rendered superfluous on account of the advanced works which we shall propose, and which will also supersede item 5, the work in front of Porchester Castle, which was designed for the purpose of preventing a bombardment.

79. Neither the advanced position in front of Gosport, nor the Hilsea Lines, will now protect Portsmouth Dockyard from bombardment by rifled guns, but they are well adapted for securing the naval establishment from capture, and, considering the great imperfections of the old fortifications of Portsmouth and Gosport, they are necessary, both for that object, and also as supports to the advanced works which we shall recommend. We are, therefore, of opinion that the works between Forts Gomer and Elson and the Hilsea Lines should be completed according to the plan already mentioned; but that the lines to connect the first-mentioned works, which it was intended to throw up at a time of expected attack, should be of permanent construction.

We also submit that the flank defence of Elson Fort, which we consider insufficient, should be improved by the substitution of caponieres capable of affording a fire of grape and canister along the ditches, instead of those now existing, which only provide a fire of a few muskets for that object.

80. Your Commissioners now proceed to consider what additional defences are necessary to protect Portsmouth Dockyard and Harbour from bombardment, which, as we before remarked, is the most probable mode by which it would be attacked by land.

No position could be more favourable for effecting this object, than that which is afforded by Portsdown Hill. From this hill, which is situated on the northern side of Portsmouth, and the distance of which from the dockyard varies from 6,000 to 9,000 yards, the naval establishments and ships in the harbour are in full view, and could be

destroyed by an enemy who should succeed in establishing himself there for a short time. Portsdown is, moreover, the point of all others round Portsmouth, which an enemy who had landed to the eastward could reach with the greatest facility.

The form of this ridge is such that it does not admit of a portion only of the position being effectually taken up for defence ; and to fortify it in the manner best adapted to the protection of Portsmouth; it is necessary to occupy the whole length of the line, which is not less than seven miles, inclusive of the two flanks, each about a mile long, connecting it with Portsmouth and Langston Harbours respectively. Fortunately the ground is very favourable for defence, being exceedingly commanding, and free from irregularities or obstructions, and these considerations in a great degree lessen the objection that might be raised to the length of the position. Another circumstance which is favorable to the occupation of the line by defensive works is, that the hill is composed of hard chalk, which it is expected will afford escarps for the fortifications, without the expense of constructing them in masonry or brickwork .

81. The peculiar character of this ridge affords a choice between two modes of fortifying it. The one to cut a deep ditch after the manner of a railway cutting (for which the chalk offers peculiar facilities) along the whole extent of the position, and to flank the ditch by guns placed in large caponières. To this it has been objected that an enemy would be sure to find means for crossing this ditch by blowing in or filling up a portion of it, in which case the whole line would be turned. The other is to erect secure detached works.

Your Commissioners having given the matter the fullest consideration, recommend that the latter system should be adopted as the best mode of occupying the ground, and the one defensible by the smallest number of men. The works should be so designed that they may hereafter be connected by lines of ditch and rampart.

We consider that there should be four principal works, viz., at Crookhorn, at the Windmill, the fir Clumps, and Nelson's Column; and that there should be three minor works at intervening points, favorable for sweeping ground in front of the position, which would otherwise be unseen. The distance between these works would average about 1,300 yards. The flanks of the position would be secured by lines of ditch and rampart, connecting it with Portsmouth Harbour and Langston Harbour. It is further requisite that there should be detached works, supported by the main line both on the right and left of the position; the former about 600 yards in advance of the work near Crookhorn, to command the approach from the village of Bedhampton; the latter on a knoll above the village of Wallington, and about a mile westward of Nelson's Column, to give additional security to the left of the line, and to occupy and command ground from whence the dockyard might otherwise be bombarded.

82. It now only remains, with respect to the defence of Portsmouth, to consider what measures should be taken to prevent a bombardment from the westward. We recommend for this purpose the establishment of three works, about 3,500 yards in front of the line between Forts Gomer and Elson ; one on the right near Newgate, co-operating with that above Wellington, in sweeping the ground in front of Fareham; the centre between Roome and Stubbington; and the left on the shore, about midway between Brown Down and the Titchfield River. These forts will be supported by the lines of works in their rear now in course of construction; and their distance apart being only about a mile, an enemy will be unable to pass between them, but will be under the necessity of besieging one of them before he can attack the dockyard.

83. The following tabular statement exhibits the comparative size of the works proposed in the additions we recommend to the defences of Portsmouth, as measured by the number of guns they will be capable of mounting; the barrack accommodation each will be calculated to afford; and the probable expense ; the whole approximately.

Position	Work	Guns	Barrack Accommodations	Expense
SPITHEAD	No Man's Land	120	700	
	Horse Sand	120	700	
	Sturbridge	120	700	
	Intermediate	60	300	
	Spit Sand	60	300	
	South Sea Castle	10		
	Gilkicker Point	9		
	Nettlestone Point	10	80	
	Appley House	10	80	
		915	2,860	£1,100,000
NEEDLES	Cliff End Batteries	20		
	Totland Point	6		
	Hatherwood Point	6		
	Needles Point	6		
	Hill Farm	12	400	

	Hurst Castle	31	300	
		81	700	£150,000
ISLE OF WIGHT	Sandown Bay	20	150	
	Near Yaverland	10	80	
	Bembridge Down	3	20	
	St. Helena Point	10	80	
	Sundown Barracks	6		
	Near Landguard	6	50	
	Atherfield Point	10	80	
	Brixton	3	20	
	Brook	3	20	
		71	500	£130,000
PORTSDOWN HILL	Crookhorn	30	300	
	Windmill	30	300	
	fir Clumps	30	300	
	Nelson Column	30	300	
	Two detached Works	50	500	
	Three minor Works	36	360	
	Farlington Lines, East flank	10	100	
	Fareham Lines, West flank	10	100	
		226	2,260	£650,000
GOSPORT	Lines connecting Forts between Gomer and Elson			£20,000
GOSPORT ADVANCE	Work near the shore, in advance of Browndown	30	300	
	" " near Room	30	300	
	" " near Newgate	30	400	
		90	1,000	£350,000
TOTALS for PORTSMOUTH and the ISLE or WIGHT		987	7,320	£2,400,000

84. It should be remarked, that neither mortars, light guns, nor howitzers for the immediate flank defence of each work, and for its interior redoubt, are included in the above enumeration: the number of these that it may be expedient to provide cannot be easily anticipated; they exist in sufficient numbers to meet any probable demand, and do not affect the strength of the garrisons required.

We calculate the garrison that will be required for Portsmouth and the Isle of Wight at a time of; expected attack, to amount to 20,000 men; 5,000 of these being for the Isle of Wight.

PLYMOUTH

(It will be understood that when "Plymouth" is spoken of, the naval establishments in and near Devonport and Keyham are particularly referred to. The town of Plymouth is situated entirely outside of the fortifications of Devonport)

85. Plymouth is the second great naval arsenal and port for men-of-war in the United Kingdom; and the defence of its dockyard and of the magnificent harbour on which it is situated, has occupied the attention of various governments from time to time. Of late years the construction of the breakwater, which provides a safe anchorage for our ships of war, the erection of the fine victualling establishment at Stonehouse, and subsequently the great extension of our naval establishments, by the construction of the steam-yard at Keyham, have presented additional objects to be defended; whilst the extent of ground which they occupy, and the great advance that has been made in the science of war, have rendered the defence more difficult.

In addition to protecting our ships and government establishments, a strongly fortified position in this part of the kingdom would be of great importance with reference to the defence of the west of England generally.

86. Plymouth would not, like Portsmouth, be in immediate connection with any plan of invasion, of which London was the objective point; on the other hand, its distance from the metropolis, causes it to be almost entirely dependent on its own garrison for defence; as a force covering the capital could not be moved away to its support. It is obvious that in case the main body of the enemy landed upon the coast of Kent or Sussex, with a view to advancing upon London from the southward, at the same time that he attacked Plymouth with a smaller force, our manoeuvring army would necessarily be operating in the south-eastern part of the country, and the attack and defence of Plymouth would be altogether a separate question.

Before entering upon the consideration of the measures proposed, we should observe that a memorandum upon the defences of Plymouth was drawn up in February 1858, and will be found in the Appendix. It was partly adopted by the Government at that time, and our recommendations are for the most part in accordance with it.

We will advert, first, to the sea defences; secondly, to the land defences.

87. The sea defences embrace three objects :—

- 1st. The defence of the entrance to the Hamoaze.
- 2nd. The security of the Sound as an anchorage for our own ships, and against its occupation by an enemy.
- 3rd. The adoption of means to prevent the bombardment of the dockyard, by the ships of the enemy at a long range.

88. With reference to the first of these, there are two channels by which ships can enter the Hamoaze. That which is ordinarily, indeed almost exclusively, used by ships of war, is the passage to the eastward of Drake's or St. Nicholas' Island. This passage can be used at all times of tide, by ships of any draft of water, and would not offer much additional difficulty to an enemy, as regards the rocks and shoals, if the buoys were removed, as he would still have the assistance of our charts. Until the introduction of steam propulsion to vessels of war, it was generally considered that the tortuous nature of the main entrance to Hamoaze, would effectually guard that harbour against an attack by the ships of an enemy, and it certainly aided such a purpose to a considerable extent; but here, as in other similar positions, little security is now afforded by such an impediment. A great advantage is, however, given to the defence of this entrance, by the position of a rock of the Western Battery, called the Vanguard Rock. A ship of moderate size and draft of water is compelled to pass on its southern side, and, when clear of it, must alter her course immediately more than eight points, to accomplish which she must reduce her speed considerably, and it may with confidence be expected that such an amount of fire can be concentrated on her, when in this position, that her further progress will be prevented.

This passage is already tolerably well covered by the guns in the existing batteries. Those on Drake's Island command the approach from the Sound, the batteries of the Citadel cross fire with those of Drake's Island on every part of the channel, and the Eastern and Western King Batteries would take up the fire as the enemy passed the Citadel. In rounding the Vanguard Rock to enter the harbour, he would, while still under the fire of Drake's Island and Western King, be exposed to the batteries on Mount Wise.

89. The other channel by which an enemy might take his ships into the harbour, is that between Drake's Island and Mount Edgcumbe. As there are barely six feet in the centre of the passage at low-water spring tides, it is evident that it is available only for vessels of light draft, and when the tide has risen several feet. But in the event of an attempt being made by an enemy in force, to obtain possession of the harbour, and to destroy the dockyard, it is highly probable that the small vessels of his fleet would be directed to take this passage; in which case the only fire that could at present be brought to bear on them, is from the work on Drake's Island and the battery of the Western King; the guns on Mount Wise being at too great a distance from the shoal part of this channel, called "the Bridge," to be effective against small vessels in rapid motion.

The situation of Drake's Island is peculiarly favourable for taking an important share in the defence of both these entrances to the harbour, as well as for the security of the Sound. We do not consider the existing battery of 22 guns sufficient, and cannot too strongly represent the necessity of strengthening the works on that island, and of arming them on every side as completely as the space and formation of the ground will allow. Batteries on this position are not only valuable, from their capability of bringing fire to bear on ships during their entire passage from the breakwater to Hamoaze; they are also well situated for affording effectual support to the Citadel, and all the other works erected for the defence of the entrance of the harbour, in the event of their being attacked from the sea. The island is surrounded by rocks, many of which are dry at low-water; it is therefore unapproachable by ships, more especially on the southern side, which is otherwise not so well protected by adjacent batteries: the importance of its position is such, as to make it requisite that the work on it be made thoroughly secure, and complete in itself, having casemated accommodation for the garrison.

90. We recommend that additional guns should be placed on Eastern King and Western King, and others on Devil's Point beyond the latter, to bear in a direction up the harbour. A battery should be constructed on or near the site of the present private saluting battery on Mount Edgcumbe, the guns of which would bear on the channels on either side of Drake's Island.

91. It is desirable that means should be adopted during a time of war to obstruct the passage by "the Bridge;" for although it is but little used during peace, except by very small vessels, it is so much more direct, and would afford the enemy the means of taking a portion of his fleet into the harbour, at high-water, under so much less an amount of

fire, than he would be exposed to by the main channels, that he would most probably take advantage of it, if the passage were left unobstructed.

92. The two remaining heads under which the sea defences of Plymouth have been classed, viz., the security of the Sound, and the prevention of bombardment of the dockyard, may be considered together ; as the works erected for the one object will to a great extent accomplish the other.

The forts at Picklecombe and Staddon Point, and the battery on Staddon Height, are all that at present exist for the defence of the entrances to the Sound. The sea face of the work on Drake's Island bears on the anchorage inside the breakwater, at a distance of 2,200 yards, and a work is commenced at Cawsand for the defence of the adjacent bay. The sites selected for the two first-named forts are well chosen, but the works themselves are insufficient in extent, and from their construction are entirely unfitted to resist the concentrated horizontal fire of shells, that could be brought to bear on them by large ships of war. The existing open battery on Staddon Height, from its elevated position and consequent immunity from the fire of ships, would materially assist in preventing an enemy from anchoring in the Sound, and would cause him much annoyance in the event of his attacking either of the forts within range of its guns.

93. It is desirable that more powerful batteries should be constructed at Staddon Point, the guns bearing on the anchorage and across the eastern entrance to the Sound. On the opposite shore of the Sound a work should be constructed under the present battery at Picklecombe. This must necessarily be casemated, owing to the limited space in front of the cliff. It should bring its principal fire to bear across the western entrance in the direction of the breakwater, the guns on its eastern face bearing on the anchorage as far to the northward as the formation of the ground will allow. An open battery should be constructed on the Hooe Lake Point, to co-operate with the work at Cawsand, not yet completed, as well as with the Picklecombe Fort; and a defensible guard-house should be built on the hill immediately above it, to protect the rear of the battery.

94. The works that have been enumerated, will suffice to prevent the enemy from occupying the anchorage inside the breakwater, and bombarding the dockyard from that position. This latter operation is, however, still possible, by vessels lying outside the breakwater towards its eastern end, from whence part of the naval establishments are visible: The fort on Staddon Point would keep small vessels from approaching the dockyard nearer than 6,500 yards ; and when it is considered that the sea is seldom sufficiently smooth in this locality to afford great accuracy of practice at that range, a very destructive bombardment need not be calculated upon; although large ships might do considerable injury from that position, by throwing shells from their upper deck with rifled guns. But another contingency has to be provided against. The defences above mentioned may effectually preclude the enemy from occupying the Sound as an anchorage, but they do not afford a secure refuge to ships seeking protection from a superior force, more especially at night. The forts on either side of the Sound are nearly 4,000 yards distant from each other, and could not effectually support our ships inside the breakwater in the event of a sudden attack.

We are therefore of opinion that a powerful casemated work, of such a form as to bring fire to bear in every direction, more especially to seaward, should be constructed immediately behind the breakwater, near its centre ; co-operating with the forts on each side of the Sound, and commanding the approach to both entrances from seaward.

95. We now proceed to consider the land defences.

A land attack may be made upon Plymouth either from the west or from the east. To the westward there are several points of the coast on which a force might be landed; and the harbours of Looe and Fowey would afford shelter, from which an enemy might base his operations for the destruction of the naval establishments. To the eastward, Torbay, Start Bay, the fine harbour of Dartmouth, and the Yealm, the latter close to Plymouth, would be available for landing troops, horses, guns, and all the necessary appliances for an attack upon the place, either with a view to its capture or bombardment;

From the westward, the enemy, after securing to himself a position between Looe and Fowey, would most probably advance through East Looe to St Martin's and Hessenford; and when near St. Germain's, he would have the choice of moving along the peninsula between the sea and the St. Germain's River, or through the country between the latter and the Tamar. From the eastward, he would probably, after effecting a landing about Torbay, attempt to seize the harbour of Dartmouth either to the right or left of which, he might take up positions out of which it would be difficult to turn him. Thence, proceeding westward, he might receive fresh accessions to his force by the inlet running up to Kingsbridge, and at other points. Continuing his advance, he might seize the Yealm, which would be very valuable to him for the landing of artillery; stores, &c. close to the object of attack.

96. It is not of course pretended to define precisely an enemy's plan of attack; but whatever his line of operations might be, there are four distinct sections- of country, from any of which he might bombard the dockyard and arsenal: The fortification of Plymouth

to landward must, therefore, be considered under these four heads ; viz.

1. The fortification of the peninsula between the St. Germain's River and the sea, which may be called the "Western Defences."
2. That of the country between the St. Germain's River and the Tamar, which may be termed the "Saltash Defences."
3. That of the country between the Tamar and the Catwater, which may be termed the "North-Eastern Defences."
4. That of the high ground between the Catwater and the Sound, which may be called the "Staddon Heights Defences."

97. As regards the first section, an item has been already introduced into the army estimates, and has been sanctioned by Parliament, for the construction of a line of works, which are already in progress, in front of the village of Anthony, and at a distance of about 6,000 yards from the dockyard.

This line is one 1 mile and a quarter in length, with a powerful Fort on either flank, and one minor, intervening work ; the left, above Tregantle Farm; the right, on a hill near Screasdon Farm; and the centre, midway between them, the distance: between the works respectively being about 700 yards, The plan also provides for the construction of permanent lines to secure either flank between the Tregantle Work and the sea-shore, and between Screasdon Fort and the St. Germain's River.

We consider that this position is judiciously chosen; that the works in course of construction will occupy the ground advantageously, and be well calculated for their object. The only suggestion we have to make respecting them is, that, instead of connecting the Works by lines thrown up at a time of expected attack, as was intended, a permanent ditch and rampart should be constructed between them.

As the fortified position in front of Anthony will completely shut an enemy out from access by land to the peninsula between the sea and St. Germain's River, it remains to be considered whether he could turn that position, by landing on any part of the shore in rear of it.

98. There are two places on which we consider an enemy might land for this purpose if unopposed; viz., Whitesand Bay and Cawsand Bay.

As regards the former, however, the coast is chiefly bounded by high and precipitous cliffs; and the only point on which he could land is near the present coast-guard station under the village of Rame, where a battery should be placed flanking the beach, and protected against assault by a small work on Knatterbury Hill. This will also support the battery for the defence of Cawsand Bay, already in course of construction, which, together with the other batteries previously mentioned with reference to the sea defences, we consider sufficient to guard against a landing in that bay. But the success of an enemy in any attempt to land inside the western defences, which would most probably result in his occupying Maker Heights, and destroying the dockyard from that position, would be so serious an event, that we consider it advisable to repair and strengthen the existing old redoubts on Maker Heights, as an additional precaution against the consequences of such a contingency; we are also of opinion that it would be desirable to construct a defensible barrack in their rear, which would act as a support to those works; and at the same time furnish troops to serve the adjacent sea batteries, and to aid in opposing any attempt to land. The position on Maker Heights would also afford a defensible line, under cover of which troops might be thrown across from Devonport, supposing the enemy had by any means obtained a temporary footing on the peninsula, between Whitesand Bay and the St. Germain's River.

99. As regards the second head, relating to the defence of the dockyard and harbour from the north-westward, we recommend that the high ground above Saltash should be occupied by three works ; one on the hill which is crossed by the old turnpike road; another on a knoll close to St. Stephen's, between that village and the first-mentioned work; a third to the left of St. Stephen's, to act as a support to this portion of the line. A breastwork should be thrown up on the edge of a deep ravine and creek on the left of the position which could be defended by field artillery; and to close the right flank, a battery, secure in itself, on a knoll commanding the bridge which crosses the mouth of a creek running up from the River Tamar at South Pill. We consider that these works should be connected by permanent lines of ditch and rampart.

In addition to the necessity of these defences for the purpose of protecting the neural establishments, they are also very important as a tête de pont, covering the magnificent railway bridge which has lately been constructed across the Tamar.

The occupation of this position would suffice for defence against artillery of the ordinary range, but would not meet the case of a bombardment by rifled guns, the ground in this quarter affording numerous views of the naval establishments; we therefore recommend that two works should be constructed in advance of this line, one on a commanding feature above Burrell House, the other on a knoll near Elmgate.

We consider that these works will sufficiently command all the ground, from which a bombardment could be effected in this direction.

100. We turn now to the third head, or "North-Eastern Defences."

The only existing works of defence to landward on the eastern side of the Hamoaze are

1. The lines of Devonport, which have been in progress at intervals from the year 1758 to the present time. Although these works are altogether ineffectual for the protection of the steamyard at Keyham, and the victualling yard, which are outside of them, they cover the dockyard and gun wharf; and are of value to a certain extent, as affording a support to any outer position that may be taken up; it has, therefore, been already deemed advisable to put them in a state to resist a coup de main, and the work is now in progress.

2. Plymouth Citadel, commenced in the reign of Charles II, and which commands the Catwater and the approaches to Hamoaze, is about 2,200 yards from the Devonport Lines; it will be a valuable support to the works on the right of the "North-Eastern Defences."

3. Two small square redoubts, of field profile, about 1,000 yards in advance of Devonport Lines; one on a commanding position to the north-east of the lines, called Mount Pleasant; the other on Stonehouse Hill, nearly midway between the lines and the Citadel. Both of these works, more especially the latter, are now much obstructed by houses.

101. Whether it were determined to protect the naval establishments from bombardment from the country between the Tamar and Catwater, or to defend them only against capture, any project of defence in this quarter, must necessarily be of a very extensive character; the naval arsenal, exclusive of the ordnance magazine establishment at Bull Point, occupies a length of nearly two miles, and it is requisite that the fortifications should be outside the towns of Plymouth, Stonehouse, and Stoke, in order to avoid the obstructions that would be caused to the works, by the extension of building, which is carried on with remarkable rapidity in this immediate neighbourhood.

102. To obtain a line for works which would cover the victualling yard, dockyard, gun-wharf, and steam yard, and at the same time be free from the obstruction of houses, the shortest position that could be taken up must have its left on Weston Mill Lake and its right on the Catwater; the length being between three and four miles; this line would not protect the arsenal from bombardment, nor include within it the great magazine establishment at Bull Point, and would be defective as a defensive position, on account of its saliency at Lipsom, as well as by leaving the Saltash Bridge open to the enemy, and enabling him to take the Saltash position in rear.

103. After having given the subject the fullest consideration, and looked at it from every point of view, we are of opinion that it will be better to take up a more advanced position, which, although a mile longer, will not be subject to any of these defects; and which, by shutting out the enemy from all ground from which he could see any part of the naval arsenal, will protect it also from bombardment.

This line has its left resting on the Tamar, near St. Budeaux, and its right at Catdown upon the Catwater. We recommend that a work should be established on the high ground between St. Budeaux and King's Tamerton, and that the line should run from thence near Burrington House, by Quarry Pound Tor House, Mount View, the hill near the Wellington Villas, in front of the Borough Gaol, and thence to Catdown; further, that an advanced work should be placed on Honiknowl, that being a point upon which an enemy might establish batteries for the destruction of ships in the harbour, and of the establishment at Keyham. We also consider that advanced works should be constructed on a hill near Burrington Farm, and on a round knoll near the village of St. Budeaux, to support that on Honiknowl, and to form in connection with it a defensive position, completely commanding the whole valley in front of the left of the line.

104. We have bestowed much deliberation upon the question of providing an enceinte to cover the dockyard, steamyard, and victualling establishment; which should at the same time afford support to the advanced line between the Tamar and Catwater.

One plan that presented itself, was to construct an interior line, from the ground immediately outside Keyham Yard, through Mount Pleasant, and the hill on which the Stoke Reservoir is situated, closing the right on the old Devonport lines; this would necessitate the purchase of a large quantity of expensive property in land and houses, and would be defective, as well on account of its leaving the victualling yard and adjacent sea batteries, outside it; as of its having a weak salient angle at the point where it would turn off towards the old lines.

The greater part of the same line was common also to the second project, which only differed from the first in closing its right on Stonehouse Hill Redoubt. It would require the purchase of a considerable section of the town of Stonehouse, in

addition to the property before referred to.

A third plan remained for consideration, which was to construct an enceinte, on the line between Keyham, Mount Pleasant, the Stoke Reservoir, and Ashpark Hill, to the work in front of the Borough Gaol; but this line, although it would not be subject to some of the objections of the other two, would, exclusive of the St. Budeaux position, which is common to both, be little less extensive than the outer position itself, and the property necessary to be purchased for carrying it into effect, would be very extensive and very costly.

In short, unless a large quantity of expensive property were acquired in order to prevent the erection of buildings thereon, any interior enceinte that could be proposed, would, if it were carried out, be obstructed by buildings in the course of a few years; and, independent of the great additional expense of such a scheme, it appears to your Commissioners that in the neighbourhood of a place like Plymouth, it would be highly inexpedient to attempt to restrict the extension of the town, within such circumscribed limits.

105. We have therefore arrived at the conclusion, that although, according to the principles usually adopted, and which we ourselves have in other cases recommended, it would be desirable to provide an inner enceinte to support the outer line of detached works; circumstances render it necessary in this instance to adopt a different plan. We accordingly recommend that the outer line of works between St. Budeaux and Catdown, should be connected by lines of ditch and rampart, and that in rear of that line, works should be constructed on the prominent features of Ashpark and Eastdown; The belt of land required for the outer detached forts will suffice also for the lines connecting them, whilst it will only be necessary to obtain a limited extent of land for the inner line of defences.

With the arrangement proposed, the right of the outer line will be supported by Plymouth Citadel, the centre by the work at Ashpark, and the left by that at Eastdown. These three points would become the depots and principal barrack stations for the main line; it is desirable therefore that casemated barracks should be constructed in the citadel in lieu of the existing old barracks, which are entirely unsuited to the requirements of the present day, and the removal of which has often been proposed. The ditches of the citadel on the land side should also be deepened, and the old redoubt on Mount Pleasant, which will become an intervening post between Ashpark and Eastdown, be improved as far as the limited extent of the site will admit.

106. We now turn to the consideration of the defences on Staddon Heights. From this position there is a full view of the naval establishments within bombarding range, and if occupied by an enemy, he might not only destroy the dockyard and ships in the harbour, but he would also take in reverse the eastern sea defences of the Sound, and the land defences between the Catwater and the Tamar. In addition to the necessity of preventing an enemy establishing himself on these heights, a fortified position thereon would cover the passage across the Catwater, and so enable troops to act either upon the flank or rear of the enemy, if advancing upon Plymouth from the eastward.

The ground, which is very favourable for defence, can be effectually taken up by two works connected by lines of ditch and rampart, and occupying an extent of little more than three quarters of a mile; the flanks will rest on strong ground, and would be closed by lines connecting them with the sea on one side, and with Hooe Lake on the other. The left flank would be further secured by the work on Catdown, before mentioned in treating of the eastern defences. The principal work would be on the main ridge between Hooe Lake and the valley of the King's Reservoir; the other, a smaller one, on the hill immediately to westward of that reservoir.

107. We cannot quit the subject of Plymouth without referring to a local question which has unusual military importance at this station, namely, its sources of water supply. The population of the three towns is almost entirely dependent upon leets or open conduits brought down from Dartmoor, and which would be cut off with great ease by an enemy. We have not thought it within our instructions to consider precisely the best mode of guarding against such a contingency; but we would strongly impress upon the local and military authorities the importance of such a measure.

108. The following table shows the comparative size of the works proposed by us in the foregoing project for the defence of Plymouth, as measured by the number of guns each is capable of mounting; the amount of bomb proof barrack accommodation to be provided, and the probable expense; the whole approximately. Neither mortars nor light guns for flanking, defence and for interior redoubts, are included:

Position	Work	No of Guns	Barrack Accommodation	Expense
SEA DEFENCES	Picklecombe	40	200	
	Staddon Point	32	180	
	Breakwater	100	600	
	Hooe Lake Point	10		

	Drake's Island	30	180	
	Eastern King	10		
	Western King	15	50	
	Saluting Battery Mount	10		
	Edgcumbe			
	Whitesand Bay	10		
	Knatterbury Hill	5	100	
		262	1,310	375,000
SALTASH	Main Work	30	300	
	St. Stephen	20}		
	Left Work	15}	200	
	South Pill	5	50	
	Burrell House	30	300	
	Elmgate	30	300	
		130	1,150	500,000
North-eastern Defences	St. Budeaux	40	500	
	Burrington House	20	200	
	Quarry Pound	30	300	
	Tor House	15	150	
	Mount View	40	500	
	Wellington Villa	15	150	
	Borough Gaol	30	300	
	Cat Down	15	150	
	Three advanced Works in front of line	25	300	
		230	2,550	1,200,000
Inner Line	East Down	30	500	
	Mount Pleasant	10	100	
	Ash Park	30	500	
		70	1,100	350,000
Staddon Heights	Main Work	30	400	
	Other Work	20	200	
		50	600	200,000
Maker Helghts	Barracks		300	25,000
Connecting Lines between Tregantle and Screasdon				20,000
TOTAL for PLYMOUTH		742	7,010	£2,670,000

We estimate the garrison that will be required for Plymouth at a time of expected attack, at 15,000 men of all arms.

PEMBROKE

109. Although the dockyard of Pembroke is not, like those which we have already considered, a fitting-out yard for the ships of the Royal Navy; its capabilities as a great building yard, to which purpose it is almost exclusively applied, are such that a larger proportion of ships of war can be constructed in it, than in any other of our naval establishments.

Its destruction by an enemy would, not be so disastrous to us as that of Portsmouth, Plymouth, or Chatham; but it is, nevertheless, the opinion of your Commissioners, that the loss of the ships in course of construction at the period of attack, and the great diminution of the power of the nation to reinforce its fleet in time of war, that would thereby be sustained, are, independent of the importance of the splendid harbour of Milford Haven, reasons abundantly sufficient for rendering it secure; more particularly as the position which it occupies is so detached from support, that it is peculiarly liable to a sudden attack, in which case it would be dependent on its own resources at the time.

110. It would be most open to attack by an enemy's fleet running up the haven; but if the dockyard and haven were only protected to seaward, the expedition prepared for that operation might also be organized for an attack by land; a body of troops, with marines and seamen, might land on one of several points favourable for debarkation on the coast of Pembrokeshire, from five to twelve miles distant, and effect the destruction of the dockyard by a coup-de-main.

111. The defence of Pembroke Dockyard has received the attention of different Governments from time to time.

Many years ago a heavy and well-planned battery, called Pater Fort, bearing down the haven, was constructed immediately outside the yard. About fifteen years since a

defensible barrack was erected on the hill immediately behind the dockyard, with a view to furnishing some defence against attack by land; and about the same time two towers were built for the purpose of flanking the dockyard wall. Subsequently batteries were established at the entrance to the haven on Thorn Island, Dale Point and West Blockhouse Point; and a three-gun tower was placed upon Stack rock.

112. Although these batteries would prevent an enemy making use of the anchorage at the mouth of Milford Haven, they would not prevent the passage of steamers of war, and therefore would not suffice to protect the dockyard or the haven itself. West Blockhouse Point and Dale Point, on the western-shore of the entrance, are each 3,000 yards from Thorn island near the eastern shore ; the Stack Rock is 2,200 yards from Thorn Island, and between these two works is the first point where an enemy would actually be opposed; after passing Thorn Island a ship would only have been exposed to the fire of the three guns on the rock and of one from the island, and when abreast of the former she would only have been exposed to one gun.

113. About a year ago, the Secretary of State for War, considering that more powerful works were necessary, both, on account of the increased powers of steamers of war and the introduction of rifled cannon, appointed a committee, of which Captain Key, R.N., and Major Jervois, RE, the one, a member, and the other the secretary to this Commission were members, to report upon the sea defences of Milford Haven.

The recommendations of this committee were:

1. That a powerful casemated battery of two tiers, besides guns on the roof, should be constructed round the three-gun tower on Stack rock.
2. That batteries should be placed on either side of the haven, that to the northward, at Southhook Point, being about 800 yards, and that to the southward, at Chapel Bay, about 1,400 yards from the rock, to support this work, and cross their fire on the haven.
3. At 3,500 yards higher up the harbour, or at 7,000 yards from the dockyard, there should be placed heavy batteries on either side of the haven at Signal Staff Point and Popton Point, where the channel is about 800 yards broad, the distance between the works being about 1,600 yards, to bear down and across the haven.
4. Between the two latter it was proposed to construct a floating barrier to prevent steamers running past their batteries, and to keep them under the concentrated fire of all the five works, should they attempt to force the passage.

114. This plan was approved by the late Government, and Parliament having voted £25,000 in the estimates (including the supplementary estimate) for the current year, the total estimate being £190,000, the works have been contracted for, and are now in progress.

As the report of the committee will be found in the Appendix, we do not enter into further details respecting it, and have only to remark, that in our opinion the plan is well devised for affording security to the dockyard against destruction, either by long-range bombardment by sea, or by the passage of an enemy's fleet up the haven. We entirely concur in the project, and recommend that its execution be actively proceeded with.

115. As in the case of the other dockyards, the defence of Pembroke Dockyard by land, must be considered either with reference to bombardment, or to its actual capture and subsequent destruction.

To the southward of Pembroke there are at least four places at which an enemy might land with guns and materiel sufficient for the bombardment of the dockyard; viz.

1. At Tenby, twelve miles distant.
2. In Lydstep Bay, nine miles distant.
3. In Freshwater Bay (East), five miles distant.
4. In Freshwater Bay (West), eight miles distant, near Castle Cove.

To the northward, he might land at Broad Haven, St. Bride's Bay, distant about nine miles ; or, as in 1797, at Fishguard Bay, which is about twenty miles distant.

116. We will first consider the defence upon the southern side of Milford Haven.

It should be observed that the dockyard is situated on the south side of the harbour, and on a peninsula, about a mile across, formed by two creeks called Pennaer Pill and East Llanion Pill, which run into the haven. At high tide, the former becomes a broad sheet of water from 400 to 1,400 yards across, navigable for vessels of about 50 tons,

whilst at low water there is but a narrow and shallow stream, which is, however, bordered on either side by a wide belt of soft mud. The latter "Pill" has in it a sheet of water about 400 yards wide at high tide, and is of the same character at low water as Pennaar Creek, but it is never navigable except by boats. The ridge between these creeks rises to a height of 215 feet, and covers the dockyard from the southward; but for several miles in the direction of Tenby there is a valley down which a good view is obtained of the dockyard, which might consequently be bombarded by an enemy without advancing more than eight miles from Tenby, between which place and Pembroke Dockyard there are two excellent roads. A view of the dockyard is also obtained from the south-westward, in which direction it ceases to be shut out by the ridge before referred to.

117. As regards the protection of the dockyard against capture by a coup de main, we recommend that a line of works, the sites for which were purchased by Government some years ago, should be constructed across the peninsula from Pennaar Pill to East Llanion Pill, with its right at Pennaar Farm, its left on Ferry Hill, with the centre on the main ridge at Bush Corner, and supported by the existing defensible barrack. We consider, however, that instead of merely taking up these points by detached forts, as was formerly proposed, the several works should be connected by lines, for which it will be necessary to purchase the land intervening between the present War Department property. We are also of opinion that in order to render the project effectual, that portion of Ferry Hill which is at present in private hands, as well as some additional ground in front of Bush Corner and Pennaar Farm, should be acquired.

By means of the line of defences just mentioned, the dockyard will be protected from any attempt to obtain possession of it without the labour of a regular siege.

118. We are of opinion that any plan we could propose for protection against bombardment, by an enemy advancing from the direction of Tenby, would be so extensive, as to be altogether out of proportion to the object; and therefore consider that it would be preferable to establish self-defensible batteries at the four landing-places before mentioned, and to rely principally, although not entirely, on preventing landing. These batteries should be secured with scarps, and provided with bomb-proof cover within their enclosure, in order to give an enemy much trouble, and cause him considerable delay before he could effect their capture, so that there would be abundant time for a portion of the garrison from Pembroke to arrive for the defence of the bay attacked; considering the loss the enemy would sustain in forcing a landing under these circumstances, it is probable that the inducement would not be sufficient to lead him to hazard the attempt; any other scheme would require a considerable outlay for the purchase of land, besides the construction of at least four considerable works, and, after all, would not be effectual; whilst a comparatively small quantity of land will suffice for the works at the four bays, and the works themselves will be of a less costly character.

119. The remaining point to be considered with reference to the defence of Pembroke Dockyard, is to provide against its being bombarded by an enemy who had landed for the purpose either at St. Bride's Bay or Fishguard Bay. It does not appear to your Commissioners that it would be desirable in this case to attempt to effect the object by the defence of the landing-places, which are too distant from the place and from one another, to be conveniently held. Moreover, the ground on the north side of the haven so completely shuts out the dockyard from view, that protection against bombardment can be afforded by establishing a line of small detached works, with the flanks resting on the haven, at a distance averaging about 3,500 yards from the point to be protected.

Your Commissioners, therefore, propose that six small works, about 1,400 yards distant from each other, should be constructed; that on the left near Newton; that on the right near Burton; with intervening works near the village of Walterston; on the hill near Lower Scoveston; in the vicinity of Honeyborough; and near Barnlake. These forts, which would be of the nature of sunken towers, would suffice to oblige an enemy to land heavy guns to attack them, and so render it exceedingly improbable that the attempt would be made.

120. The following table shows the relative importance of the works proposed by us in the foregoing project for the defence of Pembroke, as measured by the number of guns each will be capable of mounting; the amount of barrack accommodation to be provided, and the probable expense; the whole approximately. Neither mortars nor light guns for flanking defence and for interior redoubts, are included.

Position	Work	No of Guns	Barrack Accommodation	Expense
BAYS TO SOUTHWARD OF MILFORD HAVEN	Tenby	15	150	
	Caldy Island	10	100	
	Lydstep	6	50	
	Freshwater, East	6	50	
	Freshwater, West	6	50	
		43	400	£100,000

ENCEINTE ON SOUTH SIDE OF HAVEN	Pennaar Farm	15	150	
	Bush Corner	20	300	
	Ferry Hill	15	200	
	Advanced Work	6		
	Intermediate Work	6		
		62	650	£250,000
NORTH SIDE OF HAVEN	Scoveston	20	300	
	Walterston	6	50	
	Honeyborough	6	50	
	Barnlake	6	50	
	Newton	10	100	
	Burton	10	100	
		58	650	£250,000
TOTAL FOR PEMBROKE		163	1,700	£600,000

We estimate the garrison that would be required for Pembroke at a time of expected attack, including the sea-defences now in progress, at from 7,000 to 8,000 men of all arms.

PORTLAND

121. The fine harbour of Portland, now so nearly approaching completion, affording as it does a secure anchorage of great extent and very easy of access, must at all times be a naval station of great value ; but its situation and capabilities will render it of especial importance to this country in the event of war ; it is therefore absolutely necessary that it should be so effectually defended as to ensure its use to ourselves, and deny its possession to an enemy.

The harbour is partly formed by the Chesil Beach, about a mile and a half long, which constitutes a natural breakwater, connecting the (so called) Island of Portland with the main land, but owes its principal value to an artificial breakwater of about the same length, which, commencing at the north-east point of the island, extends in a northerly direction towards the opposite shore of the bay, between Weymouth and St. Alban's Head.

There are no naval establishments at Portland, and we are informed that there is no present intention of constructing any; so that the defence of this station has reference only to the security of the harbour. At the same time we should remark, that if it ever be decided to provide storehouses and other appliances for refitting or provisioning a fleet at this station, it will be impossible, by any works of fortification, to protect them, from bombardment, owing to the salient position of Portland, and to there being no points on which such works could be established, to prevent an enemy's ships or gun-boats lying off either to the eastward or westward within bombarding range.

122. An attack upon Portland may be of two kinds :-

1. By a squadron, superior in force at the time, running into the harbour and capturing or destroying any of our ships lying at anchor. This attack might be carried out in conjunction with the landing of a small force, to take by a coup-de-main, any batteries that might be insufficiently protected:

2. The other attack might be for the sake of obtaining actual possession of the harbour; but such an operation could only be undertaken by a large force, and probably in connexion with an invasion of the country.

123. We consider that the works which have already been approved of, most of which are now in progress, will, when completed, be very powerful; and that they will suffice to render the harbour quite secure against either of these attacks; we have therefore only to state generally the nature of those works, and to recommend that every available means may be adopted to complete them as soon as possible.

The summit of the Island of Portland, called the Verne Hill, which on its northern and eastern sides is already nearly inaccessible, is being isolated by cutting a ditch in the rock, of unusual breadth and depth, with the double object of creating an almost impassible obstacle and of procuring material for the breakwater ; behind this ditch a great rampart is being thrown up, and under the rampart capacious bomb-proof barracks are in course of construction. The whole will, when completed, form a citadel of great strength, enclosing an area of about 56 acres, commanding nearly the whole island, and supporting earthen batteries on its eastern, western, and northern sides. Those to the eastward will bear on the offing, and on the approaches of the harbour; those to the westward upon West Bay, and upon the approach from landward by the Chesil Beach ; those to the northward will bear upon the harbour itself. Several batteries on the eastern side of the Verne Hill are already constructed.

A small battery is also in course of construction upon the inner pier-head of the southern entrance* of the harbour, the object of this being to have a few guns in a salient

position, from which a fire can be brought to bear, so as to flank the front of the open earthen batteries on the eastern side of the Verne; this battery will also afford some support to a large casemated work which it has already been decided to place on the extremity of the breakwater.

*Note.—It was originally proposed to place batteries on both the piers of the southern entrance, but one of these has been considered unnecessary.

124. It has also been proposed to place open batteries supported by the Citadel, and about 2,000 yards distant from it, on the height above Dirdale Point, a little southward of the Convict Prison, and at Blackner Point on the western side of the island, the former to guard against the possibility of an enemy lying off Grove Point and shelling the ships in the harbour, the latter to afford a cross fire on an enemy's ships in West Bay.

125. The work on the Verne hill, with the batteries supported by it, will deny the use of the harbour to an enemy, but it will not prevent him, if of superior naval force, from entering it at the northern side, and capturing or destroying ships lying at anchor, being too far distant from that quarter to afford them support.

It has therefore been decided to construct heavy batteries on the Nothe, near Weymouth, in addition to the powerful casemated work on the end of the breakwater above referred to, the distance between them being 3,400 yards; the first of these has been already commenced, and preparations are about to be made for the latter by cutting, the stone, which can be laid as soon as the breakwater is carried out to the extent decided upon. In addition to the protection of the harbour, the former work will bring a fire to bear on the shore of Weymouth Bay, which is the only part of the coast to the eastward of Portland, between it and St. Alban's Head, where an enemy could land in any force for the purpose of attack; the latter work will co-operate with that of the Nothe Point in bringing a fire to bear across the entrance to the harbour, and will be capable of affording effective support to a squadron taking refuge within the harbour from a superior naval force.

The work on the Nothe will be partly casemated, but will consist chiefly of earthen batteries; that on the breakwater will be a circular casemated battery, similar in construction to those proposed for the defence of Spithead.

126. Although, as before remarked, we consider that these works will amply suffice for the defence of Portland Harbour, still, looking forward to the possibility of, the construction of naval establishments at this station at some future time, and considering that the land in the neighbourhood of Weymouth will certainly increase in value and is already about to be built over, considering also the admirable position which is afforded by the high ground from the Nothe Point by Wyke Regis, with its left resting on the East Fleet; and that this position, in addition to its affording the means of enabling the garrison of Portland to communicate with the main land, would also defend the harbour against bombardment by an enemy landed in the country; your Commissioners recommend the purchase of a belt of land along that line as a measure of precaution, but do not recommend that any immediate steps should be taken for the construction of works thereon.

127. We estimate the cost of this land at £100,000, and consider that a sum of £150,000, in addition to that which has already been brought before Parliament, will eventually be required for the completion of the works already sanctioned and specified above. Part of the latter sum will be applied to the works at Dirdale Point and Blackner Point, including their sites; another part to the batteries outside the Verne citadel; no estimate has yet been submitted to Parliament for either of these services; a further portion will be required to meet the expense of making some necessary purchases of land near the citadel. The remainder will be in addition to the sums already sanctioned on account of the work at the Verne, the estimate for which was formed on the supposition that it would be done chiefly by convicts, whereas, in order to expedite their execution, contract labour has been resorted to.

128. The works when completed will require a garrison of 3,000 men at a time of expected attack.

THAMES, MEDWAY, AND CHATHAM.

129. The defence of the Thames involves interests of vast magnitude; it includes the security of the great powder magazine establishment at Purfleet; the important arsenal at Woolwich and the adjoining dockyard; the Government victualling stores and ship-building yard at Deptford; the large amount of valuable property extending for many miles on either bank of the river; the fleet of merchant shipping moored in the port of London; and, lastly, the metropolis itself. Great injury might be inflicted upon any or all of these by the ships of an enemy during the temporary absence of our own fleet from our shores; little argument, therefore, is needed to show that the efficient defence of the Thames is an object of most vital importance.

The navigation of the channels at the entrance offers considerable difficulty to those who are unacquainted with the locality; but we cannot anticipate that an enemy would be unable to obtain experienced pilots to conduct his ships, when we look to the large number of foreign trading vessels and fishermen who have unlimited opportunities of becoming acquainted with the coast, assisted, as they would be, by our charts, beacons, and leading marks. We submit that it would be most unwise to trust to such a means of defence, as would be afforded by the removal of the buoys and beacons, now placed to indicate the channels and dangers; the obstruction that would be offered to our own trade would be felt by the commercial world as almost as serious an evil as the attack itself; while, on the other hand, an enemy's fleet, in command of the North Sea, would have no difficulty in buoying the channel in two or three days for the passage of his own ships.

130. No practical project could be devised for protecting the entrance of the Thames by means of permanent fortifications; but, in order to prevent an enemy from obtaining unopposed possession of those waters, we are of opinion that moveable floating batteries, of the description mentioned in the preliminary part of this Report, should be stationed at Sheerness; these vessels, navigating among dangerous shoals, with which our officers would be thoroughly acquainted, would effectually protect the entrance of the Thames against any attempt on the part of a small squadron of the enemy; and would oppose a formidable check to the advance of even a superior force, by retarding them in the operation of buoying the channels, and attacking them when among the shoals, which are so numerous in that locality.

131. The works at present existing for the defence of the Thames are as follow: On the left bank at Coalhouse Point there is an open battery mounting 17 guns; on the opposite shore at Shornemead, about a mile higher up the river, there is a battery of 13 guns raking the approach; and at a distance of two miles from this latter work, still higher up the stream, are Tilbury Fort and the Gravesend Battery, the one affording a fire of 32 heavy guns down and across the channel, the other having 15 guns bearing down the river.

We are of opinion that although the positions are well selected, the works are insufficient to meet the description of attack that would probably be brought against them. The extent of injury that could be inflicted by an enemy who had succeeded in forcing his way up the Thames, renders it probable that a very powerful naval force would be employed in such a service.

132. We consider that the part of the river between Coalhouse Point and the opposite bank, where it is about 1,000 yards broad, is that best adapted for preventing, by means of permanent works, the further advance of a hostile fleet; and it has the advantage of being in immediate connexion with the lines which we propose for the land defence of Chatham on its western side, the right flank of which rests on the Thames at that spot. We recommend that the Shornemead Battery, which is admirably situated, should be enlarged, and, as its importance is considerably increased by its connexion with the proposed defences of Chatham, it should be converted into a strong work on the land side. At Coalhouse Point, on the left bank, a powerful battery should be placed in addition to or in extension of the existing one, bringing the principal part of its fire to bear down the river and across the channel, but having some guns also bearing up the river in the direction of Gravesend. In addition to these, a work should be constructed on the right bank, opposite Coalhouse Point, at the southern point of the entrance to Cliffe Creek; and a floating barrier should be moored in time of war across the river, under the protection of these batteries, leaving a passage for our own vessels, for closing which every possible precaution should be taken at a time of expected attack.

133. In the event of the enemy's ships succeeding in forcing this first line of defence, in effecting which it is probable that he would receive considerable damage, he would then come under the fire of the batteries at Tilbury Fort and Gravesend; and we consider this second line so important that we recommend that these works should be put into the most thoroughly efficient state in every respect; their guns would cross their fire, at a distance of 2,000 yards, with those on Coalhouse Point and Shornemead; and a similar obstruction or floating barrier to that above recommended should be prepared, to be moored between Gravesend and Tilbury Fort.

MEDWAY.

134. The dockyards of Chatham and Sheerness are situated on this river. The former, already of great value as a building yard, is about 13 miles from the entrance, and can be approached at half tide by vessels of considerable draft; its importance will be much increased when the extensive enlargement of the site, and improvements in the navigation of the river, now commenced, shall be completed. The latter establishment, which is situated on the right bank of the Medway, at its junction with the Thames, is principally used for fitting out, refitting, and repairing ships of war; and is inferior in importance to the other naval dockyards; it possesses but one building slip for the construction of vessels, and any extension of the present site is almost impracticable.

135. The defences of the naval establishments on the Medway against attack by a hostile fleet, may be classed under three heads :-

1. The security of Sheerness Dockyard against bombardment.
2. To guard against the occupation of the anchorage in the entrance of the Medway by the ships of an enemy, and subsequent capture of that dockyard.
3. To deny the navigation of the river to an enemy, thus securing Chatham Dockyard against a naval attack.

136. To the first of these we have given much consideration, and have arrived at the conclusion that any system of defence by fortification, that would afford an efficient protection against the bombardment of Sheerness Dockyard, by a fleet in the offing, must be so extensive, and the works of so costly a nature, owing to their being constructed in deep water, that it would be unadvisable to recommend the adoption of any permanent defensive measures for this purpose; we have been aided in this opinion by the consideration that Sheerness Dockyard is not of such vital importance to the efficiency of our fleet, that the partial destruction of it by bombardment, would materially cripple our naval resources.

We consider, however, that the force of moveable floating batteries, which has been previously referred to, should be stationed at Sheerness, for the purpose of aiding in the defence of the Thames and Medway, as well as to guard against any desultory attacks that might be attempted by a small force of the enemy, with the object of bombarding Sheerness Dockyard. It is considered that such a means of defence would materially assist in checking the advance of an enemy in whatever force, and hamper him considerably in any operations he might undertake in this vicinity.

137. The existing works of defence under the second head are as follows : The north front of the Sheerness Lines, which is well armed, and is capable of bringing a heavy fire to bear on the channel by which ships must approach, to enter the Medway; and the battery on Garrison Point, which, in conjunction with a 5-gun tower on the Grain Spit, bears on the channel, and on the anchorage in front of the dockyard. We are of opinion that although the channel of approach is well covered by the fire of the existing batteries, the two latter works are insufficient for the protection of the anchorage should the enemy's ships have arrived abreast of the Garrison Point, and therefore recommend that a powerful casemated work, somewhat similar to that proposed by Major-General Sir John Jones so far back as 1840, should be constructed on that point. This work would, in addition to commanding the entrance of the Medway, materially aid in defeating any attempt to carry the dockyard by a coup-domain, along the wharf forming its river front, and would also effectually secure the left flank of the land defences. A battery should be constructed on the bank of the Medway, on the right flank of the land defences, to co-operate with the works at the entrance of the river in commanding the anchorage. A portion of the fire from this work should bear across and up the river, to prevent an enemy from anchoring with impunity anywhere within range of its guns.

138. We also propose that a casemated battery should be constructed on the Grain Spit, enclosing the present tower, to oppose the entrance of ships, and to flank the beach of Grain Island within its range. To co-operate with and support this work, an open battery should be placed on the Isle of Grain, the guns of which should bear down the channel and across the Medway. This battery will be secured against assault, by a work upon the rising ground in its rear, which will also deny the occupation of the island to an enemy, and will co-operate with a work at Slough Point, to be presently referred to when treating of the defences of Chatham, in preventing the landing of an enemy on any part of the adjacent shore.

Your Commissioners are of opinion that the works here enumerated will afford the protection necessary to secure the dockyard against capture by a naval force.

139. The third point to be determined is the best means of preventing a hostile fleet from ascending the river for the purpose of destroying Chatham Dockyard.

The measures that have been proposed for the defence of the entrance of the Medway will effect that object only to a limited extent; an enterprising enemy might, without delaying to attack the batteries, steam rapidly past them, and then, unless other means had been adopted to arrest his progress, Chatham would be open to his attack.

If a well-constructed boom were moored between the points forming the entrance of the river it would offer considerable additional obstruction to an enemy's squadron: but to this there are many objections; the tide runs with such velocity between these points, that it would be very difficult to moor a floating barrier of sufficient size in such a position; added to which, the chafe and fretting of the various portions of it, caused by the swell that so frequently prevails there, would involve constant repairs, and render it almost impracticable to secure its efficiency. In any case, we do not consider it advisable to trust to one line of defence alone for the protection of such important interests as exist in the Medway.

We therefore recommend that works should be constructed about four miles below

St. Mary's Island, on Okeham Ness and the small island to eastward of it on the opposite shore ; both these would bear down the river as well as across it. We also recommend that a boom should be placed at a time of expected attack between these two works, under the protection of their fire; thus effectually closing the passage of the river against the ships of an enemy.

140. It remains to be considered what measures are necessary for the improvement of the fortifications of Sheerness with reference to the attack of an enemy on the land side. The floating batteries before referred to, would probably prevent the success of any attempt to land on the Island of Sheppey, unless their attention were engaged by a simultaneous attack upon the Thames, in which case it is probable that a force might be thrown on shore at the mouth of the Swale. But, however this may be, the defences at the mouth of the Medway would still be open to the attack of an enemy who had landed on the east coast of Kent, and as the capture of them would, in addition to giving the enemy possession of the dockyard of Sheerness, go far towards opening a passage for a naval attack upon Chatham, it becomes necessary to render those defences secure against such a contingency.

141. The existing works of defence on the land side of Sheerness were constructed in 1780 and 1796, and were subsequently added to about the year 1825. They consist of a line of bastioned earthworks, with wet ditches, enclosing the dockyard and neighbouring town. There are also some works at Garrison Point, which were originated in the time of Charles II. The former line of defences is much obstructed by a suburb called Mile Town, which has sprung up immediately outside them, in consequence of the land occupied by it not having been purchased by the Government, at the time the fortifications were constructed, and their defence would consequently be very difficult, owing to the cover thus afforded to an enemy in carrying on his operations against the place. We therefore consider that advanced works should be constructed outside Mile Town, and the question arises, whether they should be placed immediately outside that suburb or on a range of hills at some distance from the place. With respect to the former position, the land would be expensive, and it would be necessary to purchase a great quantity of it to prevent its being built over; the works would also be subject, to some extent, to be looked into from the adjacent high ground. We therefore recommend that a position be taken up on the hills, about 3,500 yards in advance of the present lines, somewhat as was proposed in 1825, by a Committee who then reported upon the defences of Sheerness. The ground would be occupied by three works; the main one, on Furze Hill, should be secure in itself, and the other two advanced works on either side of it supported by the former, and commanding the ground at the extremities of the ridge.

An enemy would be under the necessity of taking this position before he could attack the land fronts of Sheerness, and in the mean time the ground between the existing works and the advanced position could, in great part, be inundated to a depth of two feet by cutting through the sea-wall.

142. The proposed works, in conjunction with those already existing, will suffice to prevent an enemy obtaining possession of the dockyard or of the sea batteries on the eastern side of the Medway; but they will not protect the dockyard against distant bombardment. Your Commissioners submit, however, that as Sheerness cannot be defended by fortifications against such an attack by sea, an operation of much less risk and difficulty, and one which would render the landing of any force unnecessary, there would be no object in protecting it by permanent works, which must be of a very extensive character, against bombardment by land.

CHATHAM.

143. Independent of the importance of its dockyard, to which we have referred in the preceding section, Chatham occupies a position of considerable value in a military point of view. It is situated on the main road from Dover and East Kent to London, at that point where the Medway is crossed by two contiguous bridges (one being a railway bridge), above which the river is for several miles impassable for an army unprovided with a pontoon train; whilst the difficulty of effecting a passage between the dockyard and the mouth of the Medway, owing to the marshy nature of the banks of the river, and the general conformation of the neighbouring country, renders it extremely improbable that an enemy would attempt to cross below the bridge. Chatham being, moreover, near the left flank of the commanding range of chalk hills which, extending through Kent and Surrey to Guildford, terminates near the camp at Aldershot, and near the right of a range of a similar character which runs towards Dover; it has a strategical importance which might be useful under certain circumstances of attack.

144. An enemy who had landed near Deal, and should be marching on London, would be obliged to attack the fortifications of Chatham, or to make a considerable detour by Maidstone; in the latter case, Chatham would be on his right flank, and after he had crossed the high chalk range near Wrotham, the garrison of Chatham might harass his rear, unless he detached a considerable force to mask it. Again, the garrison of Chatham, aided by that of Dover, operating along the chalk ridge between those two places, would threaten the communications of a hostile force which had succeeded in landing on the coast to westward of Dover. Further, in the event of an

enemy having effected a successful disembarkation on the coast near Harwich, the garrison of Chatham would be favourably placed for moving across the Thames, to the aid of our army operating in that direction, or for the purpose of acting on the left flank of the enemy.

These circumstances, combined with the growing importance of Chatham, and the fact that it is our great naval establishment in the eastern part of England (for, as we have already stated, Sheerness Dockyard is of comparatively small importance), have led us to the conclusion that there are abundant reasons for adding very considerably to the existing fortifications.

145. The defensive works at present consist of the old Chatham Lines, constructed at intervals between the years 1710 and 1806, of which the escarps are in some places only 14 or 15 feet high, occupying an extent of one mile and a half in length, immediately enclosing the dockyard, gun wharf, and military establishments, and with both their flanks resting on the river. To the right of these lines, the position is extended so as to cover the bridges, and is occupied by two forts, called Fort Pitt and Fort Clarence, constructed between 1780 and 1812, the former a work of some size, but with low escarps; the latter a brick tower with a line of rampart and ditch on either side of it, closed at the flanks by two small towers, one of which is on the bank of the river. There is also a small tower between Chatham Lines and Fort Pitt, and another about midway between Fort Pitt and Fort Clarence. It was apparently intended to connect these works by lines, to form a continuous position between the right of Chatham Lines and the river at Fort Clarence, but the project was only partially carried into effect.

The extent of the position from Chatham Lines by Fort Pitt. and Fort Clarence to the river is also about one mile and a half, making the total length of line from the left of Chatham Lines to Fort Clarence about three miles. There are also in existence, in front of the left of Chatham Lines, an old redoubt, called Gillingham Fort, and a brick martello tower, both of which are obsolete and in a state of decay.

On the left bank of the river, opposite the dockyard, is Upnor Castle, also an obsolete work, built in the reign of Queen Elizabeth. It is at present occupied by a portion of the great powder magazine establishment of the Chatham District.

146. We now proceed to consider the nature of attack to which Chatham Dockyard would be subject.

As is the case with the other dockyards, it may of course be attacked either with a view to the capture, and subsequent possession of the place, or for the purpose of effecting its destruction by bombardment.

A naval attack might be made upon Chatham by an enemy's fleet pushing up the Medway, as was done by the Dutch in the reign of Charles II, but this contingency would be met by the proposed fortifications of that river, which we have previously had under consideration.

147. The lines of attack by land may be divided into three sections; the first to the eastward; the second to the westward of the Medway; the third to the northward of Chatham, between the Thames and the Medway. The first section has reference to the advance of an enemy who had landed on the eastern coast of Kent or at the mouth of the East Swale near Faversham; the second section to the case of an enemy advancing upon London from the south or south-east coast, and attacking Chatham, either by detaching a corps to his right, when on his march, or subsequently to a victory which had given him command of the capital; the third section, to the contingency of an enemy, superior at sea, effecting a disembarkation on the right bank of the Thames, between the defences of that river, at Cliffs Creek, and those of the Medway at the Isle of Grain.

The first we will call for distinction the "Eastern Defences"

The second the "Western Defences"

The third the "Northern Defences"

148. The existing works afford some degree of protection against an attack upon Chatham from the eastward, but their profile is for the most part so insignificant, that they would be open to be carried by escalade with facility. The naval arsenal being hidden by the ground occupied by the Lines, a bombardment from that quarter is not much to be apprehended, and the object to be kept in view in this part of the position is to strengthen it against capture. The defences in advance of Fort Pitt, and the works on either side of it, should be disposed so as to afford security against bombardment as well as against capture, for there is a full view of the dockyard from several portions of the ground to southward of the existing fortifications.

We are of opinion, as regards the advanced works of the lines, that the requisite degree of defence would be afforded by establishing two important self-defensible works, secure

against escalade, one about Star Hill, the other at or near the village of Gillingham. The site of the village itself would be the best for the latter work; but it is feared that the expense of purchasing houses would be so great, that a spot must be chosen in lieu thereof, in front of the village. These works would be about a mile apart, and about the same distance in advance of the lines.

To protect the place against bombardment from the ground to southward of Fort Pitt, we consider that three advanced works should be constructed at intervals of nearly a mile from each other, and about three quarters of a mile in advance of the existing works. That on the right would be at Cookham Hill; that on the left on the hill above the village of Luton, co-operating with the work on Star Hill; the intervening work would be to the west of the Chatham and Maidstone Road, about midway between the other two, but rather more advanced. These forts would be well supported by the existing defences, which we consider should be put into an efficient state, and the connecting lines between them completed. A small work should be placed upon the high ground 600 or 700 yards to the eastward of Fort Pitt, on land which was purchased when the existing works were constructed. The object of this work would be to close the left flank of the southern defences, to assist in the defence of the deep valley between it and Chatham Lines, and to afford a closer support to the work above Luton.

149. To fortify Chatham against the attack of an enemy on the left bank of the Medway, there is a choice between three courses. One is to establish a line of works with its left resting on the left bank of the Medway opposite Fort Clarence, and its right at West Hoe Creek, occupying intermediate points between Temple Farm, Reed Farm, Strood Hill, Frindsbury Mills, and Four Elms Hill. It would also be essential, in the event of this line being taken up, to occupy with a strong work, Gad's Hill, a commanding point on the main ridge between the Thames and Medway, and about a mile from Reed's Farm and Strood Hill. The length of this line, which would not protect the dockyard from bombardment from the high ground between the two rivers, would be five miles, exclusive of the work on Gad's Hill.

The second position that might be taken up, would, like the first, rest on the Medway, nearly opposite Fort Clarence, pass near Temple Farm and Reed Farm, but after that strike off for Gad's Hill, and thence by the high ground near Mockbeggar and Islingham to Four Elms Hill and Hoe Creek. This line, which would be upwards of six miles long, would protect the dockyard from bombardment, except from the marshes on the right flank, and from some ground near the village of Cuxton, in advance of the left flank.

The third line is common to the latter as far as Gad's Hill, but from thence it cuts across to the work at Shornemead, which has been referred to under the head of the Defences of the Thames; it is altogether five miles in length, but the ground on its right being marshy, and easily defended by a wet ditch, whilst the work at Shornemead is essential for defence, irrespective of the object now under consideration, the distance necessary to occupy on account of the Western Defences of Chatham is practically reduced to a length of four miles. It would be less extensive than either of the other two lines, and at the same time cheaper and much more effectual; it would protect the dockyard from bombardment, except from the ground near Cuxton before referred to; which would, however, be so very difficult of access to an enemy, that we do not consider it advisable to incur the expense of occupying it by a permanent work.

150. As regards an attack upon Chatham Dockyard by an enemy attempting to land between Cliffe Creek and the Isle of Grain, there are two modes of defence by which an attack of this description may be met; first, to take measures to prevent the possibility of his landing; second, to fortify the place in such a way as to secure it against bombardment, in case he should have effected a landing.

Any project that would accomplish the latter object must be very extensive and very costly; whilst, on the other hand, the former may be effected by establishing a self defensible work on the rising ground near the village of Slough, in conjunction with the work on the Isle of Grain previously mentioned in treating of the defences of the Medway; and, in the event of attack, by cutting, at the last moment, through the Thames embankment, thus inundating the marshes between Cliffe Creek and Slough, the level of those marshes being about five feet below high-water spring tides.

We have, therefore, no hesitation in proposing this course; especially as it will, in conjunction with the line of works recommended in the preceding section, complete the conversion of the whole peninsula between the Thames and the Medway into an entrenched camp; and that for a less sum than would be requisite for fortifying Chatham itself upon the left bank of the latter river.

151. The following tabular statement exhibits the relative importance of the works proposed by us for the defence of the Thames, Medway, and Chatham, as measured by the number of guns they will be capable of mounting; the amount of bomb-proof barrack accommodation each will be calculated to afford; and the probable expense; the whole approximately. Mortars, and light guns for flanking defence, and or interior redoubts, are not included.

Position	Work	No of Guns	Barrack Accommodation	Expense
THAMES	Coalhouse Point	30	300	
	Cliff Creek	30	300	
	Shornemead	30	300	
	Slough Point	20	200	
		110	1,100	£180,000
MEDWAY				
SEA DEFENCES	Main Work, Isle of Grain	20	250	
	Auxiliary Battery	12		
	Grain Spit	50	250	
	Garrison Point, Sheerness	40	200	
	Okeham Ness	25	400	
	Opposite Shore	25		
		172	1,100	£300,000
SHEERNESS				
LAND DEFENCES	Furze Hill	20	300	
	Two advanced works	12		
		32	300	£150,000
CHATHAM				
EASTERN DEFENCES	Gillingham	30	300	
	Star Hill	40	400	
	Luton	25	250	
	Bridge Wood	40	400	
	Cookham	30	300	
	East of Fort Pitt	10	100	
		175	1,750	£650,000
WESTERN DEFENCES	Gad's Hill	80	1,000	
	Reed Farm	30	300	
	Temple Farm	30	300	
	Work between Grads Hill and Shornemead	20	200	
		160	1,800	£700,000
TOTAL for the DEFENCE of the THAMES, the MEDWAY and CHATHAM		649	6,050	£1,980,000

We consider that at a time of expected attack these positions will require a total garrison of 13,000 men of all arms.

WOOLWICH

152. Woolwich has been for a very long period the head quarters of the Royal Artillery, and for more than half a century the only place of manufacture for field artillery equipments, naval and other gun-carriages, pyrotechnical compositions, and, in short, of nearly every description of matériel of war for the land and sea services. It has also been the chief depot of all these articles when manufactured, and the place from whence they are principally shipped for all parts of the world. The dockyard at this port ranks high among the naval establishments as a building and steam yard, and has partaken fully of the large expenditure devoted to the improvement of those establishments of late years. The arsenal has been doubled in extent since the commencement of the Crimean war, and nearly a million sterling has, we believe, been devoted to the erection of new works, and the introduction of new machinery, within that period. The powers of production of the several departments have been remarkably increased by these measures, and at the same time the progress of improvement in artillery has called for a degree of uniformity in the articles manufactured, which is more dependent upon special machinery than was the case before. We may add, that the introduction of rifled cannon, with all their attendant requirements, has, within the present year, given fresh development to establishments which were already of great extent in comparison with foreign arsenals, and of more than proportionate importance, being the only ones of the kind existing in Great Britain, and the sole national reliance for many supplies.

153. Woolwich has always been an open town. Documents exist showing that the expediency of providing some protection for the numerous military and naval establishments collected here has been mooted from time to time. A proposal to occupy Shooter's Hill by a permanent work was brought forward by H.R.H. the Duke of York half a century ago; but no actual attempt has been made to fortify the place. The necessity

of including Shooter's Hill and the ridge adjoining it obliges a development of works which would have been unexampled in this country at any former time.

Our instructions direct us to consider what steps should be taken for defending the approaches to Woolwich, and what defensive works, if any, it may be necessary to construct with a view to its protection against an attack by land, such works being at the same time regarded as an important element in the means of defence for the metropolis. The first part of the question, which refers to an attack by an enemy's fleet or squadron, has already been disposed of, when treating of the defence of the Thames; it only remains, therefore, to consider what measures would suffice to protect Woolwich, in the event of an attack by land.

154. Your Commissioners have given much attention to this subject. The Royal Arsenal now occupies an area of 264 acres, and is separated from the dockyard, which only occupies 56 acres, by an intervening space of about half a mile. There is a tract of marsh land, for the most part below high-water mark, and capable of being easily flooded, on the opposite bank of the river, here 500 yards broad. The width of this district is sufficient to make approaches on that side very difficult, if not impossible, if it were inundated; but it does not extend as far as the present limits of range of artillery. Both establishments are commanded to the south by the heights of Shooters Hill, which is the most prominent feature in this portion of the country, or respectively by those of Charlton, or Plumstead, and Bostall Heath, at distances varying from 1,000 to 4,000 yards.

Any chain of works on the south side of the river must, we conceive, have its right resting on the Thames, at the Greenwich Marshes, cross the Dover Road between Charlton and Kidbrook, and passing round Shooter's Hill, extend along the ridge to its extremity near Shrewsbury House; from this point it may either be continued along the high ground by East Wickham and *Northumberland Heath to Erith, or it may be carried down to the river by Plumstead Heath. The former, which we will first consider, would be about 8 1/2 miles long, and would afford complete protection to the arsenal on the south side of the Thames. To secure the establishments from bombardment on the north side of the river, we can suggest no shorter line than one between eight and nine miles in length through West Ham and the old Roman encampment to Dagenham Marsh; this would require the construction of eight or nine works connected by lines; it would rest its left upon a region of docks and commercial establishments, involving a very serious sacrifice of property. The probable cost of this project, including the purchase of land, which would be very expensive, cannot be put down at less than three millions and a half to four millions sterling.

(* The ground about Belvedere is so built over that it would be out of the question to take that line.)

An alternative plan that suggests itself is to limit the defence to the extent requisite to protect the dockyard and arsenal against capture. On the south side, this project includes the works of the first scheme from the Greenwich Marshes to Shrewsbury House; from this point it follows the line of Plumstead Heath, whence it would be connected with the river by a line of ditch and rampart, at a distance of less than a mile from the arsenal, leaving an enemy free to establish himself on Bostall Heath within bombarding range. To the north of the river, one large work would be necessary near East Ham, with lines connecting it with the river. The approximate estimate of this project, including cost of land, cannot be taken at less than two millions sterling.

155. We are not prepared to say that the advantages that would be obtained by such an outlay in fortifying Woolwich would be sufficient to warrant us in recommending either of these projects for execution. It appears to us that the operations of an enemy against the place by land necessarily imply the successful disembarkation of his army on our shores, the subsequent defeat of our manoeuvring army in the field, and the consequent advance of the enemy upon the capital. Under these circumstances, and considering its immediate connexion with London, in our opinion it is doubtful whether, even if Woolwich were converted into an extensive entrenched camp, it would hold out long after the occupation of the Metropolis by the invader. Besides, the fortress of Chatham, which is only 20 miles to the eastward of Woolwich, would to a certain extent supersede the latter, whether in its bearing upon the advance of an enemy from the eastern coast of Kent, or in its power of acting upon the flank of a hostile army moving upon London from the direction of Harwich; if it were considered advisable to provide an extensive fortified position in the neighbourhood of London, it is probable that other positions might be chosen affording greater advantages, which might go far towards the realization of a scheme of more general application to the defence of the Metropolis, and thereby provide for the security of Woolwich itself.

156. We are, nevertheless, of opinion, that it is very unadvisable that the arsenal should be left as at present, so wholly undefended, as to admit of an enemy taking possession of it immediately he had succeeded in reaching the outskirts of the capital; and we have, therefore, considered whether any other plan, of a less extensive character, which would not be subject to the objections incident to the larger projects, can be adopted. It appears to your Commissioners that a large work of fortification upon Shooter's Hill, which commands the whole of the country in the neighbourhood of

Woolwich, would of itself have great influence in the defence of the Government establishments; whilst it would be only about one-third of the cost of the lesser project before referred to, and would require a comparatively small body of men to hold it. It would provide a place of security in the neighbourhood of London, and would aid in the protection of the Metropolis, supposing the enemy to be advancing from the south-east; thereby in all probability preventing his taking that line of attack, and enabling us to direct our attention more particularly to other points. It would form a nucleus to field-works, which might, if circumstances rendered it desirable, be thrown up in this quarter; and in case of a battle being lost to the southward of London, in which event the enemy would most probably attempt to turn the right flank of our army in order to force it to retire across the Thames to the eastward of London, where there are no permanent bridges, the fortifications of Shooter's Hill would cover its passage over the military bridge, which would necessarily be formed for the purpose about this point. Without the means of covering such a retreat, our army would be shut up in the district to the south-east of London, and its communications with the interior of the country might be cut off.

On these grounds, therefore, we recommend that Shooter's Hill be permanently fortified.

157. With this view of the defence of Woolwich, it appears the more necessary that measures should be adopted to mitigate as much as possible the evil results that under existing arrangements would arise from the loss of this important arsenal. It has already been determined upon by the Government to establish a second arsenal or great depot, somewhere in the interior of the country; and we have accordingly been instructed to select a site. We have visited Weedon with this object, and, although convinced that it is not well suited for the intended purpose, we see no reason to doubt that a place in every way suitable may be found elsewhere, and propose turning our attention to this subject with as little delay as possible.

With Chatham fortified as we now propose, and in immediate communication both by water and railway with Woolwich, a depot might be established within its defences which, in addition to those now in course of formation at Portsmouth and elsewhere, would relieve Woolwich of the greater part of its stores, and Chatham would be nearly as convenient as Woolwich for shipping to out-stations or to the foreign dependencies of the Kingdom. In addition to these arrangements, we submit that the operations of the arsenal at Woolwich should hereafter be limited as much as possible to the production of warlike stores, their issue for service to be conducted elsewhere; that a complete provision of every description of warlike store required for an active defence of the country, for at least three months, be established in the proposed interior arsenal; with duplicate patterns, and all other requisites for the production of the same articles by the mechanical resources of the country, in the event of the loss or destruction of Woolwich.

158. We conceive that the work which we have recommended on Shooter's Hill, will cost £700,000, including the purchase of land, and will afford bomb-proof barrack accommodation for about 1,500 men.

DOVER.

159. The questions that arise in considering the fortification of Dover, are in some respects of a nature dissimilar from those which have been discussed in treating of the places already mentioned. Dover does not contain either a dockyard or arsenal which it is necessary to protect from bombardment or capture. It is, in fact, the only place in England which partakes of the nature of a strategical fortress or intrenched camp in its primary object.

The objection we have referred to in the opening part of this Report to the construction of fortifications purely for strategical purposes applies, therefore, in some respects to Dover; and if there were no works of defence or military establishments there already, it appears to your Commissioners that it would become a question whether that place should or should not be fortified.

160. The considerations that have led to the construction of fortifications at Dover from time to time may be classed under three heads:

1. Being the nearest point to the opposite coast, the possession of the strong ground about Dover, which would give an enemy command of the harbour and roadstead, would afford him immense advantage, as a tete de ponte under cover of which he could throw troops into this country.
2. That if fortified effectually, Dover becomes a secure military position of great value with reference to the landing of an enemy upon any part of the coast of Kent, in the event of which he would be obliged to besiege Dover, or to mask it with a considerable force, in order to prevent the garrison of the place acting upon his communications during his advance. With this view, we understand that the plan of the commander-in-chief, at the time of the expected invasion at the beginning of this century, was to make Dover the point d'appui of his regular

army, intending to act upon the flanks and rear of the enemy, instead of manoeuvring in such way as to cover London.

3. The scheme for constructing a large harbour of refuge is an additional reason for fortifying Dover ; and as it has already progressed to such an extent as to furnish some shelter, which would render it valuable to an enemy, and afford a good pier for disembarkation, it is one which holds good, even although the harbour project be not fully carried into effect.

Weighing these reasons, and bearing in mind that extensive, although very imperfect works of fortification already exist at Dover, and that certain improvements have already been authorized by Parliament, Your Commissioners are of opinion that no other course is open but to complete the works in progress, and to give the defences such additional strength as may be considered necessary to render them secure.

161. The fortifications of Dover consist of the works on the high ground to the westward, commonly called the Western Heights; and of the Castle, on the eastern side of the town, which lies in a deep valley between them. The former were commenced prior to the year 1780, and then consisted only of field works, which about the year 1803 were partly converted into permanent works. The Castle is many hundred years old, and during some part of the last century earthworks and defences of more modern construction were added to it.

On the western heights, the Citadel occupies the western portion of the position, the eastern end being taken up by a small fort called the Drop Redoubt. To the north, these works are partly connected by lines, which have been left in an unfinished state. The Citadel is connected with the shore by a line, which is also incomplete; behind the left flank of this line is Archcliff Fort, an old work constructed in the time of Henry VIII., quite seen into from the high ground in its rear, much obstructed by houses, and only useful as a sea battery.

The Castle is 1,100 yards distant from the western heights; it is of importance, as occupying ground from whence the harbour is completely commanded. The fire from its left enfilades the valley in front of the western heights, and an attack on the north front of that position could not be carried on, until the guns of the Castle bearing in that direction had been silenced.

The completion of the works on the western heights, and several improvements to the existing defences, are now in full progress, as follows; viz., the formation of the ground between the Citadel and Drop Redoubt, so as to be seen from the former work; the completion of the north lines and of a work in the centre of these lines, called the North Centre Bastion; caponieres to flank the ditches of the Drop Redoubt, and a counterscarp to that work, are in course of execution ; the connexion of the latter work with the adjacent cliff by a rampart and ditch; the formation of an outwork to strengthen the west front of the Citadel, which is the part most open to attack; the scarping of the south side of the heights, that portion of the works being at present quite open ; the completion of the line connecting the Citadel with the sea ; casemated barracks for officers, for whom there is at present no accommodation in the Citadel, are being provided; lastly, store-rooms and powder magazines, for which there was no previous provision, are being constructed.

It appears to Your Commissioners that these works are necessary to render the western heights secure, and they recommend that they be carried out according to the authorized plans, which seem to be well devised.

162. Several improvements are projected in the Castle, but the works are not yet commenced. They are as follows; viz., the remodelling of the outwork at the northern salient, in such a way as to afford a fire to its front, and a reverse fire along the adjacent ditches; the construction of escarps where at present none exist; and of caponieres to flank the ditches generally; the remodelling of some of the exterior portions of the work, more especially on the eastern side, where the ground in front of it is at present imperfectly seen; the formation of earthen batteries in the interior portion of the work.

Your Commissioners consider that these improvements should be carried into effect; but they are also of opinion that some bomb-proof cover should be provided behind the ramparts of the Castle ; and they consider that the work is so weak at its northern salient, that, in order to prevent an enemy establishing his batteries on the high ground, which overlooks the Castle in that direction, a work secure in itself should be constructed upon that ground near Castle Farm.

163. We have given our consideration to the question of connecting the Castle and the western heights by a line of ditch and rampart, but although such an addition would be a great improvement to the defences of Dover, we are precluded from recommending it, by the large amount of house property which it would be necessary to purchase, at great cost, before such a project could be carried into effect. Plans for connecting lines might, however, be advantageously prepared beforehand, and left for execution to a time of expected attack.

As regards the expense of the improvements, £165,000 has already been sanctioned by Parliament for the purpose, and we consider that a further sum of about £170,000 will be requisite to carry into effect all that is required.

The garrison necessary for Dover is estimated at 6,000 men as a minimum.

CORK

164. The harbour of Cork possesses great capabilities as a naval port, being easy of access and egress, and affording a safe anchorage within its waters for a very large fleet of men-of-war and merchant ships. In time of war it would occupy an important naval strategical position for the defence of Ireland, and the west coast of England and Wales; also as an advanced position clear of the channel, where a fleet might wait orders with the certainty of not being delayed by westerly gales, and where convoys might rendezvous, having reached this point of departure by a coasting voyage inside Scilly, thereby avoiding the enemy's cruisers.

Cork harbour offers strong natural features for defence against an attack by sea, and the naval establishments at Haulbowline which, though limited, afford means of refitting, coaling, and provisioning the ships of the fleet, are so situated as to be secure from bombardment by sea until the enemy has actual possession of the anchorage.

165. The works existing for its defence are as follows: The Camden and Carlisle Forts, situated on the commanding positions which are afforded by the points forming the entrance, on the western and eastern sides respectively; the former mounting twelve guns to seaward, the latter eleven guns, and two guns on a tower in connexion with it: a bastioned work on Spike Island, commanding the anchorage, armed with eighty guns; fourteen of which bear in the direction of the entrance: and a one-gun tower on Haulbowline Island.

The importance of securing this harbour for the service of our own fleet renders it, necessary that the existing defences should be strengthened; and, in a few instances which we will now specify, additional batteries will be required.

166. We recommend that the land defences of Camden Fort and Carlisle Fort should be remodelled, in order to secure these important works from being taken in reverse by a force landed for that purpose; that at the former, sufficient space should be enclosed to admit of an extension of the sea batteries on the harbour face, so as to afford a reverse fire on ships passing up the channel; and that more guns should be brought to bear to the southward on the approach to the harbour; a similar extension of the existing fire from Carlisle Fort is also necessary.

167. As regards Spike Island, we are of opinion that the line of casemates now in course of construction on the north curtain should be completed, that the remains of Westmoreland Fort should be removed, and that additional guns should be mounted on the southern face, bearing on the harbour and the entrance. It is desirable to occupy Cork Beg with a small work, to prevent an enemy from obtaining possession of it, as well as to afford a better cross fire on the harbour.

The old battery under the hospital at Queenstown, which is now dismantled, should be remodelled, and armed with one tier of heavy guns. The position of this work is admirably adapted for raking the approach to the upper part of the harbour, and would afford support to the work on Spike Island, if attacked on the eastern side, on which side it is most easily assailable.

We further recommend that a small open battery should be placed on White Point, to rake the narrow channel between Spike Island and Queenstown, and to aid in the protection of that part of the harbour.

Your Commissioners consider that the additions they have now proposed will render the harbour of Cork and the establishments at Haulbowline secure against a naval attack.

168. To protect them against being fired into by a force landed for the purpose, there already exist four towers, each for one gun, three of them on the north shore of Cove, placed with reference to an attempt of an enemy to establish himself on that island. The other tower is at Ringaskiddy, a prominent feature to the westward, and commanding the harbour from that side.

Any position that could be taken up for the complete protection of the harbour and naval establishment against a land attack would be very extensive, and would render necessary a garrison quite disproportionate to the object. We consider, therefore, that the best mode of providing against such a contingency would be to establish towers for the defence of the landing places on either side of Cork, at Ballycotton Bay, and Ringabella Cove, between Youghal and Kinsale. Four towers would suffice for this purpose, three at the former, and one at the latter place.

169. The harbour of Kinsale is already protected by Charles Fort, and if a small work for four or five guns be constructed for the defence of the tidal harbour of Youghal, we consider that the operation it would be necessary for an enemy to undertake before he could establish batteries on the ground commanding the harbour would be too extensive for the object; as the possession of the anchorage, which would be the great inducement, could not be obtained without the reduction of the works on Spike Island, and those at the entrance to the harbour, which would be an operation requiring considerable time;

170. We estimate the expense of carrying out our recommendations respecting Cork approximately at £120,000, on the supposition that a great portion of the work will be done by the convicts who are imprisoned in Spike Island.

A garrison of about 2,500 men would be required for the defence of Cork harbour.

171. Your Commissioners now proceed to submit a concise statement, in tabular form, of the number of guns, amount of barrack accommodation, and probable expense of all the works they have recommended, together with similar information respecting those in progress.

Station	Guns		Barrack Accomodation, chiefly bomb-proof		Expense of Works including purchase of land	
	No.	Total	No. of Men	Total		Total
PORTSMOUTH AND ISLE OF WIGHT						
Recommended by Royal Commission	987		7,320		2,400,000	
In works in progress	280		1,500		400,000	
		1,267		8,820		2,800,000
PLYMOUTH						
Recommended by Royal Commission	742		7,010		2,670,000	
In works in progress	120		1,000		350,000	
		862		8,010		3,020,000
PEMBROKE						
Recommended by Royal Commission	163		1,700		600,000	
In works in progress	150		1,000		165,000	
		313		2,700		765,000
PORTLAND						
Recommended by Royal Commission					250,000*	
*£100,000 for purchase of land and £150,000 for works already projected						
In works in progress	300		2,300		380,000	
		300		2,300		630,000
THAMES						
Recommended by Royal Commission	110	110	1,100	1,100	180,000	180,000
MEDWAY AND SHEERNESS						
Recommended by Royal Commission	204	204	1,400	1,400	450,000	450,000
CHATHAM						
Recommended by Royal Commission	335	335	3,550	3,550	1,350,000	1,350,000
WOOLWICH						
Recommended by Royal Commission	150	150	1,500	1,500	700,000	700,000
DOVER						
Recommended by Royal Commission	30		300		170,000	
In works in progress	60		300		165,000	
		90		600		335,000
CORK						
Recommended by Royal Commission	90	90	600	600	120,000	120,000
Total Guns and Barracks		3,721		30,580		
Armaments of Works recommended by Royal Commission						£500,000
Floating Defences						£1,000,000
Total Estimate of Expense						£11,850,000

172. We have now completed the task assigned to us by Your Majesty's Royal Commission, to the extent of our present instruction, reserving only, for a subsequent Report, the question of an internal Arsenal. We submit our unanimous recommendations to Your Majesty's gracious consideration, with a firm conviction that their adoption will place the Power of this country, for self-defence, on a par with its other elements of greatness and

strength; will give security to its industry and commerce; afford a guarantee for the maintenance of peace; and add a new glory to Your Majesty's reign.

Witness our hands and seals, this Seventh day of February 1860.

(Signed) HARRY D. JONES, Major General.
D. A. CAMERON, Major General.
GEO. ELLIOT, Rear Admiral.
F. ABBOTT, Major General.
A. COOPER KEY, Captain RN.
J. H. LEFROY, Colonel RA.
JAS. FERGUSSON.

WM. F. DRUMMOND JERVOIS,
Major R.E., and Assist. I.G.F.,
Secretary.