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To cite this article: Captain W. Horton R.N. (1866) The Necessity for Building Un-Armoured Ships of War, Royal United Services Institution. Journal, 10:38, 1-36, DOI: [10.1080/03071846609417195](https://doi.org/10.1080/03071846609417195)

To link to this article: <http://dx.doi.org/10.1080/03071846609417195>

Published online: 11 Sep 2009.

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The Journal

OF THE

Royal United Service Institution.

VOL. X.

1866.

No. XXXVIII.

Evening Meeting.

Monday, January 15th, 1866.

CAPTAIN E. GARDINER FISHBOURNE, R.N., C.B., in the Chair.

NAMES of MEMBERS who joined the Institution between the 1st and 15th January, 1866.

ANNUAL.

Jackson, J. H., Ensign 90th Regiment. 11.	Clementson, Charles, Lieut.-Col., Northumberland Artillery Militia. 11.
Beadon, O. A., Lieut. Royal Marine Light Infantry. 11.	Robinson, C. W., Lieut. Rifle Brigade. 11.
Durrant, F., Lieut. R.N. 11.	Montgomerie, A. W., Capt. 20th Hussars. 11.

THE NECESSITY FOR BUILDING UN-ARMoured SHIPS OF WAR.

By Captain W. HORROX, R.N.

ALREADY twice within twelve years have we heard of reconstruction of the British Navy.

Considerations of improved efficiency of individual ships on the pattern, more or less, in either case, set before us by the French, have led to these expensive changes which have been followed in their own degrees by other European nations.

The remaining navies of Europe, that of France excepted, have been hitherto inconsiderable; but the same means of improvement adopted elsewhere, and consequently thrust upon this country, have rendered almost equally powerful with the fleet of France, those of both Italy and Russia. Iron-clad ships have also found favour in Austria, and even in Turkey, while the restoration of the Spanish Navy to a prominent position is a very popular idea in that country, and not unlikely to be fulfilled under the rapidly increasing wealth and prosperity of a kingdom which numbers upwards of 60,000 enrolled seamen along her Atlantic and Mediterranean coasts.

I mentioned considerations of efficiency of ships as having led us on to reconstruction, first in establishing a magnificent force of ships of the line, and powerful frigates and corvettes propelled by steam, then in calling into existence a number of iron-clads, which has ever and anon been counted over and compared with those of France, people being content in general to measure our strength according to that of our ancient adversary—our recent rival and ally—and to omit from the question altogether political combinations which, were they to arise in less quiet times than these, might bring into array against us a vastly superior force of those expensive and now much-criticised iron-clad ships. With properly armed and efficiently turretted armour-ships, supplemented by the powerful forts and batteries now in course of construction or completion, and yet further aided by a properly organised system of torpedo defence, we may trust, under Providence, to defy as heretofore, the attack of our own shores by the world in arms.

In the years, however, which have elapsed since the invasion of this country was happily averted by our great naval triumphs of the last generation, so great a change has come over the nature of our colonial possessions, colonial population, and maritime commerce, that political considerations of a different character cannot fail, ere long, to dictate the nature of such changes as we must see, take the place of the two recent re-constructions.

Re-formation, or re-organisation would be more fitting terms to apply to that which must soon and surely ensue, including a speciality of certain classes of ships adapted for certain services.

We witnessed during the late lamentable strife between the Federal and Confederate States of North America, what serious injury could in a short time be inflicted upon the extended commerce of their powerful adversary, by a comparatively weak confederation, possessing no navy whatever, through the skilful employment of some small and indifferent vessels, surreptitiously obtained from this country.

The Northern commerce was completely paralysed by the seeming ubiquity of the "Sumter," the "Alabama," and a few more casual cruisers, all of a very inferior description. The fixed determination of purpose which enabled the North to prevail at length, after four years' strife, and to maintain the Union whose disruption was at stake, caused the adoption of wise measures for carrying that purpose into effect, and all sacrifices at sea were unresistingly borne with, in order that the blockade of the Southern coasts might be maintained as efficiently as possible.

The lesson learnt at such prodigious cost was not thrown away upon the hard-headed, astute statesmen who hold high office in the United States, and who carry vigorously into effect whatever measures they deem to be for their country's welfare.

Accordingly, before the war was at an end, it was determined to establish a class of vessels for foreign service possessing great speed, and carrying very heavy guns, which, if they at all approach the idea upon which they were designed, will have it in their power, so long as they continue unopposed by more numerous ships of superior, or at least of equal speed and armament, effectually to sweep the seas of any commerce against which they may be launched. Such ships will

be fit to fight on favourable terms when the occasion may arise, and able to flee beyond possibility of capture, from any description of vessels now existing elsewhere, and which might happen to carry a superior armament or thicker sides. Having for their object the annihilation of our enemy's commerce on the sea, they would scarcely stop in their "Alabama"-like career of depredation to measure their strength against an adversary better armed than themselves.

Viewing this statement from the opposite side, it would appear that in competition with such ships, any that we now possess would be equally unfit to fight them when such might be their policy, and incapable of overtaking them if they chose to run away. The conditions of a contest between opponents thus unequally matched are such as cannot be contemplated with much satisfaction from our view of the case, as it now stands.

In pursuing this policy, the Americans are following out the principle which has ever governed their naval administration. Since they were a nation, it has been their object to possess some one class of vessels enjoying a manifest superiority over the corresponding class in our Navy.

We suffered in bygone times from their use of long guns, as opposed to carronades, and from their employment of heavy frigates, with which we had none fit to compete on equal terms.

The gallant action of the "Endymion" with the "President," and the noble heroism which made the "Chesapeake" fall prize to the little "Shannon" in 15 minutes, were as cheering lights in a dismal view: but they scarcely sufficed to dispel the gloom which hung over most of our naval actions in the last American war, from 1812 to 1815. Our crews fought bravely, and were bravely led against those who were their equals in every other respect, whilst fired with the double impulse of excited hate and fear of the halter, fighting in superior numbers, wielding better weapons, and flushed with the success attending their contest with an enemy whose force was inferior to them in every instance in which they were engaged.

Opposing to those of the enemy, smaller ships, feebly armed and thinly manned, was the means by which the Government of that day contrived to tarnish the glory of the British flag in the eyes of a world little informed as to the real merit of the actions which took place.

Let us trust that no future time, should war unhappily arise, may witness the navy of Great Britain contending on such miserably unequal terms against the enemies of their country, armed with every advantage which science, bravery, and nautical skill could embark on their side. Yet, we seem to trust, as a nation, to that favouring Providence alone, which has hitherto helped us out of every difficulty,—forgetting, to all appearance and on all occasions, the ancient adage that "the gods help those who help themselves."

The early onslaught of a sudden war will surely test our state of preparation, leaving little time, perchance, for that bringing up of *lee-way* for which the tardy operations of former times gave place, and by which we were enabled through superior sources at hand, as compared with those then at the command of our enemies, to leave off on

better terms than those on which we had begun. It is obvious that in the present day, howsoever great may be our own resources, the comparison with those of other nations is less remarkable than formerly, and I shall presently show that the impulse of a civil war called forth the energies of manufacturing skill in the United States in a manner not to be overlooked, if, indeed, to be equalled in this country. And as in the daily operations of life, the willing giant steam is made to spare the sinews of thousands of men and tens of thousands of horses in producing the materials in question, so should the very best and fittest weapons be prepared beforehand, and placed in the hands of a nation's warriors in the day of trial, if they are expected to win her cause by their skilful use of them. For, as little could the labour be accomplished without the aid of steam, by which those ships are built and those weapons manufactured, as men can have it in their power to overtake fast ships with slow ones, or to keep on an equality in fighting, when small guns and few of them, are opposed to heavy guns in larger numbers.

None but the very fastest ships, armed with the very best guns that can be put into them at the time, should be opposed to those, be they weak or be they strong, with whom we may have to contend.

Unity of design and fixity of purpose appear ever wanting under our Parliamentary Government where the intentions of one Administration are rarely those of their successors, and where spasmodic efforts, oftentimes the consequence of popular panic, are as often misdirected. With great energy we produced in no long time a considerable fleet of screw ships of the line. They still exist in our ports, but they have lived their little day of usefulness, and are acknowledgedly unfit to cope with any iron-sided ship, however inferior to them in armament and crew.

These have, therefore, taken the place of the others as the exponents of our naval force; but they would, as a combined fleet, operate under one very great disadvantage against a French force of equally powerful armament.

Omitting, for the sake of argument, the question of whose plates are thickest, or whose guns the best, the French ships are designed so much under one idea, and with qualities for carrying that idea into effect, that they are able to manœuvre under steam with very great precision.

Our own may possibly be classed, in point of speed, in three squadrons, comprising respectively the first six ships in the subjoined list as a 14-knot squadron, the second six as going 13 knots, and the next five going 12 knots; but even these varieties of ships differ among themselves, perhaps (excepting the "Defence" and "Resistance"), in respect of sea-going qualities and turning power; while what remain of our 32 iron-clad ships, large and small, complete, or in course of completion, are a miscellaneous collection, no two of which, however excellent as individual ships, would recognise each other as sisters.*

* From this statement I must except the "Birkenhead Rams," ("Scorpion," and "Wyvern"), which, as regards hull and engines, are precisely similar.—W.H.

Speed on trial at measured mile.	Names.	Horse- power.	Guns.	Tonnage.
Knots.				
15·487	Minotaur.....	1350	26	6621
	Agincourt	1350	26	6621
	Northumberland	1350	26	6621
14·358	Achilles	1250	20	6121
14·356	Warrior	1250	32	6109
14·215	Black Prince	1250	41	6109
12·94	Caledonia	1000	35	4125
13·533	Lord Clyde	1000	24	4067
13 ?	Lord Warden	1000	24	4067
13·119	Prince Consort	1000	35	4045
12·896	Ocean	1000	23	4047
14 ?	Bellerophon	1000	14	4246
12·36	Hector.....	800	24	4089
11·433	Valiant	800	24	4063
13 ?	Royal Alfred	800	18	4015
	Zealous	800	20	3716
12·529	Royal Oak	800	35	4056
11·618	Defence	600	16	3720
12·332	Resistance	600	16	3710
12·5 ?	Penelope (twin screw)	600	10	2947
13 ?	Pallas	600	6	2372
11·819	Favourite	400	10	2094
10·354	Research.....	200	4	1253
9·944	Enterprise	160	4	993
11·86	Viper	167	2	737
9 ?	Vixen	160	2	754
9 ?	Waterwitch.....	167	2	778
<i>Turret Ships.</i>				
12·253	Royal Sovereign.....	800	5	3765
10·5 ?	Prince Albert.....	500	4	2529
10·515	Scorpion	350	4	1857
10·039	Wyvern	350	4	1857
12·171	Amazon		4	1081
<i>Floating Batteries.</i>				
	Erebus.....	200	16	1954
	Terror	200	16	1971
	Thunderbolt	200	16	1973
	Ætna	150	16	1588
	Thunder	150	14	1469

These ships have not all been tried.—W.II.

In this list of 32 ships (not counting the 5 floating batteries), there are 11 classes in respect of guns, 10 in point of horse-power, and 9 classes of tonnage. The grand total of guns is 616; of horse-power, 24,354; and of tons, 120,379; ships, 37.—W.II.

I wish particularly to impress upon the meeting that I have not prepared this statement with the object of finding fault. Our ships may be, and probably are, very superior, taken collectively or otherwise, to the iron-clad force of any other nation.

I have drawn up this table for the sake of pointing out how one Government may adopt a principle, and work it out with determination of purpose, while that of another nation may accumulate most valuable

FRENCH IRON-CLADS.

From "Statesman's Year Book, 1866."

	Guns.	Horse-power.
Magenta	52	1000
Solferrino	52	1000
Couronne	40	900
Normandie	36	900
Invincible	36	900
Gloire	36	900
Provence	36	900
Héroïne	36	900
Savoie	36	900
Revanche	36	900
Surveillante	36	900
Flandre	36	900
Guyenne	36	900
Gauloise	36	900
Valcouruse	36	900
Magnanime	36	900
Taureau (cupola, ram)	1	500
Tormante	16	225
Dévastation	16	225
Lave	16	225
Foudroyante	16	225
Congrève	16	225
Saigon	14	300
Palestro	14	300
Peiho	14	300
Paixhans	14	300
Protéctrice	4	150
Impregnable	4	150
Embuscade	4	150
Refuge	4	150
Arrogante	4	150
Implacable	4	150
Opiniâtre	4	150
Ships 32	777	18,575

Divisible into 5 classes + 1 ram.—W.H.

Three more frigates and 7 corvettes were begun in 1865.

When the French ships left Spithead for Cherbourg, the signal was made to proceed at 12 knots; and they arrived at their destination accordingly, with the utmost punctuality. How many iron-clads out of our 32 could have obeyed a similar order? We know, from the similarity of the French ships, that 16 at least of theirs could have done so. Any improvement of their armament will in like manner affect all their ships of each class in a similar degree.—W.H.

individualities without arriving at an aggregate of corresponding value. *Perhaps the classification of our ships in groups may commend to more favourable consideration the French method of manœuvring in small squadrons, or *pelotons*, composed of ships possessing equal speed, and similarity of turning power.

Let all these ships be assembled as a fleet, or even suppose their distribution to be regulated with such judgment as that corresponding squadrons at least should be complete and kept together, and let two or three such squadrons assemble for performance of some particular service.

Their variety of speed and of turning power is so great, and so little brought into practice with relation to each other, that they would certainly appear as if brought together for the sake of contrast. Steam tactics, on an extended scale, may be estimated at so many hundred pounds sterling per diem, and without practice in steam tactics, such squadrons would be in constant danger of collision, or at least of the worst confusion, whenever darkness or thick weather supervened; and the inconvenience of possessing so many dissimilar classes of ships would be seriously felt by all concerned.

The ships in question may be individually very superior to the French, as I believe they are—better armed, more thickly clad, and provided with much more ingeniously expensive contrivances for a variety of uses, necessary or otherwise.

Tactics may, as regards engaging an enemy, be very possibly obsolete. Indeed, I doubt whether the best way of handling such a force of ships as these, would not be to render the attack as confused as possible, in order to confound the intended measures of the enemy, and so leave each ship to do the best she could by tackling one of them in the closest fight achievable; but such is not, perhaps, their rightful use.

To succeed in even this, however, it is needful to have the ships in presence of each other beforehand, in order to avoid delay or disadvantage when an engagement is in prospect. Secondly, for this end certain tactics are undoubtedly required; and for the due execution of technical manœuvres a greater similarity of ships is highly essential, if not absolutely necessary, especially in narrow seas and winter weather.

I am not sufficiently informed to be able to state how many ships of the French squadrons manœuvre in company, or with what degree of success; but the similarity of many of their ships, and their known power of keeping together at sea, offer sufficient contrast with the variety which prevails among our own, to illustrate how important are unity of design and consistency of purpose in the reconstruction of a navy.

Discussions in the House of Commons and observations in the public press of this country, as well as the development of gun-power, have

* An elementary trial of this system was made under Admiral the late Lord Lyons, in 1858, upon a plan drawn up by me. It was not unattended with success during a trial of many days and nights, performing every variety of manœuvre, even though the eight ships varied in size from the "Royal Albert," 131, to the "Vigilant," 4.—W.H.

no doubt exercised much influence on the fitful production of our iron-clad navy, causing frequent change of purpose, and modification of design. In France, meanwhile, the imperial programme of 1859 has been steadily wrought out in furtherance of that laid down by a decree of Louis Philippe, and modified only by the introduction of iron-clad ships as a substitute for screw ships of the line, since their successful inauguration before Kinburn in 1855.

The Napoleonic idea has been to establish an invulnerable escort for a fleet of transports capable of conveying a fully equipped force of all arms numbering 45,000 or 50,000 men. Its organisation with that object, if not perfect, has at least been for some time complete. The transports now are the dismantled line-of-battle screw-ships of a few years since. Other transports of beautiful form, and apparently capable of attaining high speed, are fitted for conveyance of horses and artillery.

Nothing, in short, is wanting but the Napoleonic will, to test the efficiency of such an equipment on the first convenient opportunity; but happily there is no longer any prospect of the experiment being made against a country whose citizens of all classes have become her defensive force, and with which country the relations of commerce have so immensely increased of late.

All other nations besides France are availing themselves largely of the turret system of central armament, the merits of which have been sufficiently set forth through the ability and steadfast perseverance of Captain Cowper Coles, to have at length overcome all the objections which prejudice could suggest, or which other considerations could dictate.

Let us trust that the day must be already near at hand when tardy justice shall be done to the value of his invention, and when sea-going turret-ships shall enable us to maintain an iron-clad force in distant seas, having coppered bottoms, steel frames, a shotproof belt and turrets, iron upperworks, and perhaps tripod masts.

Placing these in the first category as of imperative necessity to secure supremacy on the ocean, let us consider in the second place his turret-ships for Channel service. These may clearly be almost without masts. Not needing much storage of water or provisions, their space below devoted rather to coals and ammunition, ships for home service may be entrusted to the safe conduct of their engines, while those for foreign stations must have use of masts and sails, with means to feather or to lift their screws.

We may confidently trust the double screws will work themselves into favour sufficiently to overcome the financial scruples of the great engineers, whose pattern ships represent vast capital locked up in models and patterns for every variety of single screw engines adapted to our ships of war. Once overcome this obstacle, which time alone can accomplish, and which must ever delay a change of system, and even our "Warriors" and "Minotaurs" may be rendered trustworthy for narrow seas and channel service.

Counting then upon these two classes of iron-clad ships as able to carry the heaviest description of guns, viz., the sea-going iron-clads (of the future) and the turret-ships for home defence, let us turn our

thoughts to consider the best classes of un-armoured vessels, able either to cut up the commerce of our enemies, or to go forth and cope with such antagonists as now already exist, and will most certainly be employed in event of war with the United States, to intercept and destroy our distant trade.

I will endeavour to place the meeting, as concisely as I can, in possession of a very interesting statement of the steps by which the naval administration of that country was led up to the construction of what represents at present their definite idea.

The document from which I am about to read extracts, is a somewhat lengthy letter from Mr. Donald McKay, the great ship-builder, of Boston, addressed to a local newspaper, the *Boston Advertiser*, and printed in its number of 29th October, 1864.

Referring to former writings of his own, in which he had related what had come under his observation in recent visits to the naval dockyards of England and France, Mr. McKay writes: "I saw that those powers respected nothing but force, and knew that if we desired to prevent foreign intervention in our affairs, our navy must be largely increased."

I apprehend that these views, formed prior to the outbreak of the civil war in America, may, *mutatis mutandis*, be now equally entertained in other countries with reference to the United States.

Let us see then what are the powers of naval development displayed in that great country:—

"At the breaking out of the rebellion (the words are those of Mr. D. McKay) the navy consisted of the following steamers. The "screw-frigates 'Merrimack,' 'Wabash,' 'Minnesota,' and 'Colorado,' of about 3,350 tons each; of the large screw-sloop 'Niagara,' of 4,582 tons; of the first-class screw-sloops 'Richmond,' 'Brooklyn,' 'San Jacinto,' 'Hartford,' 'Pensacola,' and 'Lancaster,' of about 2,000 tons each; of the second-class sloops 'Pawnee,' 'Iroquois,' 'Wyoming,' 'Mohican,' and 'Dacotah,' of about 1,070 tons each; of the third-class sloops 'Narragansett' and 'Seminole,' of about 850 tons each; of the first-class paddle-wheel sloops 'Susquehanna' and 'Powhattan,' of about 2,430 tons; the 'Mississippi,' of 1,692, and 'Saranac,' of 1,446 tons; and of the small paddle-wheel steamers 'Michigan,' 'Saginaw,' and 'Spitfire,' of about 470 tons each; making a total of 26 steamers and 49,700 tons."

It may be well to state that the laws of American tonnage represent a larger burthen than is estimated by the present rule in this country; in other words, 100 tons British are equal to more than 100 tons American.

Mr. McKay next tells the speed of these ships, which I beg leave to read, at the risk of being tedious, and without vouching for the ratio between British and American nautical miles. It may possibly approach that which exists here between ships at sea and those on trial at the *measured* mile; nevertheless, the performance quoted does not bear the stamp of improbability. It is as follows:—

"'Niagara,' 10·9; 'Merrimack,' 'Wabash,' 'Minnesota,' 'Roanoke,' and 'Colorado,' 9; 'Brooklyn,' 9·2; 'San Jacinto,' 8·8; 'Hartford,'

"and 'Lancaster,' 9·5; 'Richmond,' 7·5; 'Pawnee,' 8; 'Iroquois,'
 " 'Wyoming,' 'Mohican,' and 'Dacotah,' 11·7; 'Narragansett,' and
 " 'Seminole,' 8; 'Susquehanna' and 'Saginaw,' 9; 'Waterwitch,' 9;
 " 'Michigan,' 10·5. The 'Pensacola' proved a total failure, and the
 " machinery had to be removed."

This statement of speed is very modest, and justifies a reliance on the others made by Mr. McKay. The last fact mentioned also shows that our transatlantic friends no more enjoy immunity from error than do we ourselves.

Let us now learn from him what means were at their command, and what results those means achieved. He says:—

"The means at the command of the Administration for building a steam navy were about 2 dozen machine shops, great and small, distributed from Maine to Maryland, many of them very small, and without the tools, workmen, or skill requisite for the production of marine machinery. The first-class shops did not exceed eight in number. But the entire force of these shops could not be commanded by the Navy Department for construction of new machinery. There were the enormous quantity of repairs to the merchant steamers of the country to be done, and new construction to be made for that service. The War Department also drew largely on their resources for transport steamers, while the locomotive and tool-making shops found it utterly impossible to meet the demand upon them. Neither were there sufficient raw materials in the country for the large and sudden demand. Hundreds of steamers, hundreds of locomotives, shops full of tools, tens of thousands of tons of metal were called for instantly, and there was nothing on hand to meet the call. War steamers cannot be built in a day. Inexperienced labour cannot be converted into skilled mechanics in a day, the prices of machinery rose immensely, the pay of the mechanics and the cost of material reached a point far above what they were worth, except from the factitious cause of the suddenness of the demand.

"The result was felt in the poor materials and poorer workmanship with which the machinery was made. Any kind of material and the most unskilled labour had to be brought into use, and all this time the amount of even that labour was constantly diminishing by the absorption of men into the military service."

Here we may learn a lesson of the penalty incurred by a state of unpreparedness. By continuing the story we shall see what can be done with comparatively small resources when strong will gives proper impulse and direction to the use of resources howsoever small.

"In this pressing emergency the Department did all that could possibly be done. It purchased every merchant steamer that could be converted into a blockading vessel or a war cruiser, and the navy at this moment contains every merchant steamer of any size or excellence that has been built in this country. It set at work every steam-engine factory in the land that could produce marine machinery. It considered all plans offered for armouring vessels, and tried many. It instituted experiments in machinery, in ordnance, and in armour-plating. It covered the Mississippi and its tributary waters with an

"immense inland fleet, many of which were armoured, and which sweeping the rebels from those waters, have been an indispensable element to our holding the whole interior of the country, as it gives us the exclusive command of its water highways. It lined the Atlantic coast with such a blockading fleet as the world never witnessed before, and has practically closed the rebellious district to the world, the few vessels which succeed in running the blockade being too small to carry cargo sufficient to give any aid of consequence.

"The rebels have not been able to import even drugs enough to supply the Medical Department of its army."

Now, these words are not mere "tall talk," they convey a record of facts important to ourselves, and against which we ought not to oppose a foolish self-sufficiency and ill-grounded self-confidence.

The results achieved in the way of ship-building are thus recorded by Mr. McKay:—"The first vessels constructed by the Department were 23 screw gun-boats of 504 tons each, with a speed of 10 knots and a draft of 9 feet. They were intended especially for blockading the mouths of the smaller rivers. The 'Iroquois,' 'Wyoming,' and 'Mohican' were next duplicated, the former twice, in the 'Oncida,' 'Kearsage,' 'Wachusett,' and 'Tuscarora.' The reason for exactly duplicating them was the fact that as the drawings and patterns were still in the hands of the original builders, the machinery could be obtained much quicker, and time was the element of most importance." How wise this course pursued by the Americans, and how different from a system, or want of system, which continues perpetually adding every variety of ships to a navy in which scarcely two agree in any one particular.

"These vessels were followed by the paddle-wheel gunboats 'Maratanza,' 'Mahaska,' 'Sebago,' 'Octorara,' 'Sonoma,' 'Conemaugh,' 'Tioga,' 'Genesee,' 'Miami,' 'Paul Jones,' 'Port Royal,' and 'Cimarron,' twelve in number, of about 850 tons each, and having a maximum speed of 11 knots per hour. To these succeeded 27 others of the same type, but larger and faster, being of 974 tons burthen, and having a maximum speed of 14.5 knots per hour.

"Their names are the 'Eutaw,' 'Sassacus,' 'Waterce,' 'Patuxet,' 'Tallapoosa,' 'Winooska,' 'Mackinaw,' 'Shamrock,' 'Tallahoma,' 'Tacony,' 'Tosco,' 'Agawam,' 'Pontosac,' 'Massasoit,' 'Osceola,' 'Mattabesett,' 'Chickopee,' 'Ascutney,' 'Otsego,' 'Metacomet,' 'Chenango,' 'Lenape,' 'Mendota,' 'Mingoe,' 'Wyalusing,' 'Pontiac,' and 'Peoria.'"

"Other seven of this class, but still larger and built of iron, have been lately added, viz., the 'Winnessee,' 'Ashuelot,' 'Muscoota,' 'Suwannee,' 'Shamokin,' 'Mohongo,' and 'Monocacy,' all of 1,030 tons. These paddle-wheel gun-boats have the light draft of 8 feet, and carry enormous batteries. They were built for special service in the narrow and tortuous channels of the shallow sounds and estuaries of the southern coasts. For these localities where turning was impossible, it was necessary they should be double-bowed, i.e., constructed with both ends alike, and that their machinery should be equally well adapted for going forward or back.

"In the autumn of 1861 the Department commenced the construction of ten second-class screw sloops of war, of about 1,350 tons. They are the 'Ticonderoga,' 'Lackawanna,' 'Shenandoah,' 'Monongahela,' 'Ossipee,' 'Juniata,' 'Sacramento,' 'Adirondack,' 'Housatonic,' and 'Canandaigua.' They have a maximum speed of 12.25 knots, carry a large armament, and are efficient ocean cruisers.

"There is now in progress of construction the 'Chattanooga,' of 3,000 tons, building for the Department by outside parties; also the 'Idaho,' of similar tonnage, and by other outside parties; while the Department is itself constructing the 'Madawaska,' 'Wampanoag,' 'Neshaming,' 'Ammonoosuc,' and 'Pompanoosuc.'

"These vessels are of wood, about 3,000 tons, and intended to have a speed of 16 knots an hour. They will carry immense batteries, be full rigged, and will doubtless prove the fastest and most formidable ocean cruisers ever built by any power.

"There are also in course of building by the Department twenty first-class wooden screw-steamers, of 2,200 tons each, to have a speed of 13 knots, carry enormous batteries, and be full-rigged for ocean cruisers. They will soon be completed." (This was more than a year ago, remember.) "They are named the 'Antietam,' 'Arapaho,' 'Guerrière,' 'Hassalo,' 'Illinois,' 'Java,' 'Keesanqua,' 'Keywadin,' 'Manitou,' 'Minnetonka,' 'Mosholu,' 'Ontario,' 'Piscataqua,' 'Pushmataha,' 'Tahgayuta,' 'Wanaloget,' 'Watanga,' 'Willamette,' 'Contoocook,' and 'Mondanin.'

"While these vessels are building, there have been completed the 'Nipsic,' 'Shawmut,' 'Nyack,' 'Pequot,' 'Maumee,' 'Kansas,' 'Yantic,' and 'Saco,' all screw vessels of 593 tons each. The machinery is from designs of various parties, building to compete with the Department. The first three having the Department's machinery, have been thoroughly tried, and can maintain a speed of 11.5 knots.

"There are now nearly completed the wooden iron-clad coast steamers 'Tonawanda,' 'Miantonomoh,' 'Agamenticus,' and 'Monadnock,' of 1,564 tons, drawing 12 feet of water, and having two turrets each, carrying two 15-inch guns. The 'Monadnock' has been tried, and is found capable of achieving a maximum speed of 11 knots.

"There are also in process of construction four other iron-clads of the same type, but larger, and to be faster. They are the 'Kalamazoo,' 'Passaconaway,' 'Quinsigamond,' and 'Shackamaxon,' each of 3,200 tons.

"The Department has also constructed 74 wooden and iron-clad vessels of the 'Monitor' type, with an aggregate tonnage of 78,000 tons.

"There are now in the navy, in active service, 558 steamers, with an aggregate tonnage of 408,000 tons, against the original 26 steamers and 49,700 tons with which the war commenced.

"Of this number, 200 steamers, with an aggregate of 241,000, have been built by the Department. In no country, and with such limited means and under such difficult circumstances, has there ever been put afloat, in the same time, such an immense naval armament. . . .

"The naval administration has done all which any naval administration could do in such a war.

"I have put forth nothing but facts, which can easily be verified by reference to official documents, and which I deem justly due to our present Navy Department. . . . Certainly it cannot be said that in the time of trial the Navy Department has been found wanting."

Most fortunate the Administration which can earn for itself such unqualified praise—and fortunate above most other nations that which can with justice accord it. The Presidential Message of last month states the number of guns in the American navy to have amounted to 3,000, while their crews numbered 50,000 men.

A few remarks upon the foregoing extracts may not be out of place. First, with regard to the much-vaunted "Monitors;" they are entirely out of favour. I cannot say whether the mode of constructing the turrets, wholly different from those of Captain Coles, occasioned disappointments, or whether they are considered to be superseded by torpedoes as a means of defending the coast. Certain of them have been converted into vessels for torpedo service, and the remainder are laid aside as not required for any present purpose. The "Monadnock," as an exception, has been sent round to California.

The verdict against them from some of the admirals was to the effect that the men who had fought in them could never after be kept from under cover when engaged, and this applied to all the iron-clads. That of the officers employed in them was that they were *hell*.

Secondly, Mr. McKay speaks vaguely of "enormous batteries," which may mean anything; but the 15-inch guns afterwards specified are a familiar fact, while we hear of 20-inch guns in course of construction.

I am not about to discuss questions of initial velocity or penetration, but will merely observe that a 15-knot steamer, armed with 15-inch guns, and able with superior speed to range alongside at any period of the 24 hours, would be a very formidable antagonist to the most heavily armoured vessel, mounting the most perfectly rifled guns of the comparatively small calibre employed by us, and possessing the best speed yet realized by any but two or three of our ships of war.

From subsequent information, I learn that the dimensions of some of these ships are as follows:—

"Ammonoosuc" Class.

3,713 tons, 17 to 19 guns.

335 feet long, by 48' 2" beam.

To steam 15 knots and upwards.

"Guerrière" Class.

3,177 tons, 21 guns.

313 feet long by 46 broad.

To steam 15 knots.

"Idaho" Class (twin screw).

2,638 tons, 8 guns.

305 feet long by 44 broad.

To steam 15 knots.

There are various other classes, some of which fall short of the original intentions of their constructors, but which may nevertheless prove most valuable cruisers. Their general proportion of length to breadth appears to be about 7 to 1.

I would leave out of the question the use of the stem on the side of the faster ship, and assume that her superior speed will always enable her to avoid that of her iron-clad opponent.

The same superiority will enable her to keep beyond the range of rifled guns by day, without losing the power of closing again at night-fall, when the long range and precision of the rifled guns would become of too uncertain effect to be reckoned as an advantage. Approaching end on, and offering comparatively but a small mark, she would find opportunity to range alongside and deliver such a discharge as would probably sink the antagonist, whether armour-plated or not; for, with guns depressed and fired only when almost touching, the 15-inch shot would probably go out through the bottom, leaving but little chance of safety. Such, it appears to me, would be the tactics to be pursued by a single ship possessing a marked superiority in speed and in calibre of guns. The use of iron under-decks and of an iron inner skin will probably keep within control the incendiary effects of shells exploding between the decks; and where destruction of the ship is the object in view, round shot of large dimensions seem to afford to a very fast ship the best means of achieving that result. The reduced number of guns, leaving available a larger proportion of the crew than formerly for the other duties of the ship, especially for extinction of fire, would point to outward injury by shot as of more serious importance in an action hereafter than the destruction of life or confusion of the crew likely to be occasioned by the explosion of shells.

This argument applies more especially against iron-clad ships whose armour would derive more injury as to sea-going qualities from violent and repeated concussion than from perforation. The iron-clad ship, with plates buckled and bolts distorted, would be left in worse case than her un-armoured wooden opponent with shot-holes plugged and fire extinguished.

Let me not be supposed to argue against a supply of rifled guns to every ship for special uses. Yet, I hold strongly to the belief that very great advantage will attach to the use of spherical shot in future naval engagements as in former ones, whether employed against ships with armour or those without. And while the Americans are increasing yet more the calibre of their smooth-bore guns, it is hardly to be supposed they will allow their largest ocean cruisers to be unprovided with whatever class of guns may be their best from time to time.

It is, moreover, contemplated, if not already arranged, that all ships

in the American navy should be provided with apparatus for the use of torpedoes.

Whether they may ever succeed at sea in landing them on the decks or placing them under the bows of vessels possessing inferior speed, is a problem as yet a long way short of solution; supposing for argument that it could be done, the explosion by means of electricity would ensue immediately, beyond hope of cutting the wire or of ejecting the intruder. The powder for this purpose would be in waterproof bags, to be swung out by whips from the yard-arms.

Whether this mode of putting salt on the bird's tail prove practicable or otherwise at sea, no doubt can exist that an unscrupulous neighbour in a neutral port, provided with these insidious means of destruction, would be a very dangerous companion; and some precautionary device to meet this danger appears to have become very necessary, for we have seen how public applause has greeted the return of officers whose personal ambition or false zeal had led them to commit the grossest outrage on neutrality.

It needs little consideration to accept the fact that vessels such as have been described and of which the full details are in this country, must, while unmatched in speed and sea-going qualities, practically command not only the seas full of our floating wealth, but must also threaten the possession or the security of our colonies in their present undefended state.

Our North American dependencies are too conveniently placed as an ever-ready means of annoyance, for the United States do really aim at their acquisition. For that reason they may possibly remain a practical pledge of peace between the two countries, so long as they continue under the British Crown. They will assuredly at the same time continue to be a perpetual source of threatened annoyance, and of consequent irritation, until declared independent.

With regard, however, to the other colonies of Great Britain, in general,—to assume that foreign nations are deceived by the nominal garrisons and tumble-down batteries in many of our distant possessions over sea, is to behave like the silly bird which buries its head in the sand or mud to seek imaginary security from its foes, or like a child which shuts its eyes and fancies itself unseen by others.

All nations must be aware that in the extended dominions of this country there are hundreds of points at which contributions to any extent could be levied with the same facility and success which attended the buccaneers of old on the Spanish Main.

Nor is it to be supposed that cruisers such as I have just described, would limit their depredations to such ships as they might meet at sea. The colonies and foreign possessions of Great Britain would furnish them with supplies of all descriptions, with abundant plunder, and with a fictitious kind of glory, cheaply acquired, to our great shame and at our expense. For the United States to send forth such cruisers, counting upon such supplies, would be a much more popular and efficacious mode of warfare than to break their heads against the stone forts and iron shields which are being made to line our shores;

still more so than to test their strength against a defensive fleet of iron-clad ships backed by a system of torpedoes.

I will now beg leave to read what many here present may have already seen in the public journals—an extract from a letter of the Prince de Joinville—no mean authority on naval affairs. The letter is dated 28th April, 1865, and appeared in the English papers in October.

Addressing an American, the Prince says:—

“ You must be proud, Sir, of the doings of your navy. With the brilliant exploit of Commodore Winslow, has the tide of victory turned with you. The achievements of Mobile Bay are without parallel, and reflect the greatest honour on your flag. All naval men pay a just tribute of admiration to Admiral Farragut, and his brother officers and men. This war will leave your navy in a very efficient state, and with a feeling of confidence in itself which is one-half of success.

“ Not so in European navies.

“ Ours is tired and disgusted by the odious service of transports imposed upon it. The British navy after a long period of inaction, and furnished with ships and men it has no confidence in, is not what it was formerly. Both navies continue to build sea-going broadside iron-clads of immense size and cost, but the policy of building such expensive ships when they may be so easily sunk by a miserable torpedo is much discussed, and the tide is coming to small iron-clads with two or four guns ‘ Monitor ’ fashion.

“ For long cruises, fast iron-clad sloops, ‘ Alabama,’ or rather ‘ Florida ’ fashion, seem also to be most appropriate. Upon all these points you have the lead.

“ Where everybody is still behind, is in gunnery. The best English gun is the 300-pounder smooth-bore, muzzle-loader, Armstrong gun, built on the coil principle and able to throw its shot with a very heavy charge of powder. The Royal Navy has no good gun of heavy calibre, but I think Mr. Blakely can turn out some very efficient ones. The French have no heavy guns, smooth-bore or rifles, and have not yet succeeded to experiment successfully on any one. The best gun we have in use is a breech-loading rifle gun, throwing a 60-lb. shot with a low charge. That gun works well, and is very accurate, but of no use against iron-clads.

“ The Emperor is trying a gun of his invention, rifled, and made of steel inside, and brass outside. I have no faith in it.

“ It is from the United States that we expect the production of the large rifled gun for sea-service, as soon as your clever workmen shall have turned their minds to the production of built-up guns of steel or wrought-iron.

“ That heavy gun is much wanted, since the battle of Mobile has so much shaken the confidence in the employment of rams.”

The following significant paragraph appeared in the papers, curiously enough, the following morning. It forms part of Mr. Adams’ letter to Earl Russell on the claims against the “ Alabama,” &c.

“ Further than this, I might only suggest to your Lordship to consider which of the nations of the world presents in every sea around

"the globe the most tempting prizes, in an event no friend would more deplore than myself, of its being again as it has so often been heretofore, doomed to be afflicted by the calamities of a war."

The practical lesson to be derived from these considerations seems to me to be, in the first place, that our nation depending so largely for its means of existence and prosperity, on the supplies derived from abroad should establish as rapidly as possible a defensive naval force in every colony capable of maintaining one, according to the provisions of an Act of Parliament passed in April last, "to make better Provision for the Naval Defence of the Colonies," a title indeed, which in itself admits the necessity for what I am endeavouring to recommend, although it is little likely to be carried into full effect so long as a semblance of defence from home is maintained.

Secondly : reserve a sufficient number of our existing iron-clads for home defence, rendering them in all respects as efficient as possible for that specific purpose, and adding to their number a great many-turret ships, almost confining our future iron-clads to that form of armament; and

Thirdly, to enlarge the idea of "improved Alabamas," as the class of small corvettes now in course of construction has been too truly termed, in favour of vessels in every respect equal, and in point of numbers far superior to the magnificent class of ships constructed in America, giving them if possible central armament in shot-proof cupolas such as have been adopted in the Italian turret-ship "l'Affondatore."

The existing engines of our line-of-battle ships might possibly be made available for propelling such ships at a very high speed.* Their wooden hulls could be quickly put together, as evidenced in the "Lord Warden," of 4,000 tons, partially armoured in course of building, which was laid down in November or December, and launched the following August.

Give them steel frames, beams, and decks, and they would be still more quickly constructed and infinitely stronger and more durable.

Such ships would not only protect our vital interests in distant seas, but would maintain the honour of our flag against all enemies whatsoever.

They would moreover, in time of peace, restore the declining spirit of seamanship in our navy, and being armed with but a small number of the heaviest guns, these might always be maintained of the best and most approved description.

To imitate the Americans still further, instead of retaining these particular ships on certain stations, spending the greater part of their time in the hurtful inactivity of foreign ports or at the various headquarters of the different admirals' commands, let their cruize extend to every sea in turn where an admiral's flag is kept flying.

* Our line-of-battle ships and frigates have a proportion of length to breadth as 4.5, or 5 to 1, while we have seen that the Americans build on a ratio of 7 to 1. This change of proportion, with the improved form of a rectangular midship section and very fine extremities, would enable the same engines to propel at a much greater speed.—W. II.

By this means each station would be provided at all times with a certain number of fast ships for any special occasion which might arise, while the ships themselves would come in turn under the command and inspection of every Commander-in-Chief.

A greater uniformity of system would thence ensue among both admirals and ships; certain specified rendezvous at particular times would keep the movements of the ships sufficiently under the control of Government, and ensure communication throughout the fleet.

The cruise of each such ship round the world, when not detained by special emergency, would be her period of commission. Its duration could be perfectly controlled by the several admirals under whose command she passed, while the functions of the admirals themselves, in taking care that every place of importance should be duly visited from time to time, would partake more of independent reality and less of the system of centralisation which, for good or for evil (and it is much to be feared that the latter condition predominates), has been in a manner forced upon every branch of the Administration through the enlarged use of the telegraph and the increased facility of communication which have arisen in the last ten or twelve years.* I may mention two circumstances in illustration of this tendency to centralize, as bearing immediately on the subject in hand.

About the year 1858, application was made by some of the Australian Governments to purchase, at a fancy price, some of the old teak block-ships fitted with screws for coast defence.

Most of the ships have since been otherwise disposed of; but the offer was then refused, as tending to separate the colonies from the Imperial Government.

In the year 1865, however, we find a Bill passed, entitled "The Colonial Naval Defence Act," giving power for colonies to provide vessels and raise men, and to commission officers, &c., the clauses of which Act may shortly be stated as follows:—

1st. Power for colonies to provide vessels and raise men and commission officers, &c.

2nd. Volunteers to form part of Royal Naval Reserve.

3rd. Power to Admiralty to issue special commissions.

4th. Placing of colonial vessel with men and officers at Her Majesty's disposal.

5th. As to services of volunteers and officers in navy.

6th. Delegation of Admiralty powers to naval officer.

7th. Not to impose charge on imperial revenues, &c.

8th. Not to affect powers vested in colonies.

I have been unable to learn in what degree it is contemplated to carry the provisions of that Act of Parliament into effect, beyond enrolment of volunteers for the Royal Naval Reserve, with a view to their employment in the Royal Navy, thus drawing a supply of seamen from the very source for the protection of which the Bill is enacted.

* It would also be a great improvement if on all foreign stations our ships were kept in more constant movement under sail, instead of remaining, as occasionally they do, for many months together in the same port, producing many inconveniences both to individuals, to discipline, and to the public service in other respects.—W. H.

For all other purposes this Act appears consigned to the same limbo with the vote for the establishment of Naval Barracks, and in which lay for many years, the Act for establishment of Naval Prisons.

The other measure to which I referred was the abolition of the Indian Navy—a small force, but efficient for the purposes required of it, and comprising a body of officers familiar with those seas in which, as a result of experience, the ships were well adapted to serve.

These two measures on the part of Her Majesty's Government, which it would be scarcely becoming on my part further to discuss, nevertheless bear strongly on the question of separate Colonial Defence, which intimately affects both the services and the distribution of our ships, and consequently the nature of the ships themselves.

Let the full purpose of the Colonial Defence Act be carried into effect, establish dockyards in the distant colonies, with suitable, and well-protected depôts of coal, and let the colonies maintain and begin to use them, in preparation for their separate existence in time to come, and thereby provide for the refit and repair of the ships of the Royal Navy in case of an extended naval war. It can hardly be said with truth that the colonies are attached to the mother country by such questions as affect the declining days of worn-out block-ships, nor, in the present day, would a warlike conflict with the mother country be the manner in which their separation should be effected; but the transfer of some of the colonies to other hands might well arise in time of war, out of their present defenceless state.

It happened on more than one occasion (so at least according to the newspaper account), that small cruisers of the Northern or Southern States during the late war, arrived in ports where no power existed able to compel their departure at the expiration of the allotted time.

The colonies should at least be made capable of resisting such casual cruisers without delay; and, by degrees, be rendered so independent as to leave our ships available for their own definite use as cruising ships of war.

Let the ships constructed to cruise upon the high seas be of a character to maintain the honour of our flag against all enemies; for this purpose let them be in all respects at least equal, individually, to any possible enemies, while numerically more powerful; and lastly, though we may hope and trust that the United States of America may not again stand in that relation to us, let us remember that heretofore we suffered more at their hands than by all other enemies combined against us, and considering them the most formidable foe with whom we may be brought into conflict, let us construct on the principle and pattern of theirs, a far larger number of similarly serviceable ships than they are likely to require or to possess.

The adoption of such a type and class of ships would not be without an incidental consequence which is professionally of the very first importance.

Together with a revival of seamanship we should obtain a considerable increase in the number of *bonâ fide* seamen.

The idea has taken hold of many minds, and I confess to having myself shared the opinion, that the introduction of iron-clad ships would

very much reduce our navy, restricting the necessary number of both officers and men, and confining within comparatively narrow limits the much-to-be-desired force which is expressed by anticipation in the term "Standing Navy."

Rightly or wrongly, the Government appears to have adopted that view of the case, and has acted upon it in all but the final object to which a reduction of number would especially have seemed to direct, and, limiting the theory of a permanent naval establishment to the existing system of engaging the men for ten years, and of supplying boys through the training-ships exclusively, a great prominence has been given to the two elements of reserve, viz., the body of 7,000 men in the Coast Guard, and whatever number may be forthcoming, when required, from among those enrolled in the Royal Naval Reserve.

The present system of manning the navy, as must be known to most persons present, is a very excellent one *as a theory* (but one which, I think I shall show, requires to be much extended in practice), viz., that of receiving scarcely any men, and those under peculiar circumstances, otherwise than by the advancement of boys as they grow up, who begin their career in the training-ships between the ages of 14½ and 16 years.

Such boys undergo an excellent preparation in ships devoted to that use, under the command of officers, especially selected on account of their qualifications. The navy affords so good an opening for respectable lads, that any number of them could be obtained from rural districts, brought up in the parish schools or workhouses, strong and healthy. Instead of which I shall presently show that only a sufficient number of boys are allowed to pass through the training-ships to supply one-half of the annual waste.

Leaving aside the quality of the article, and dealing only with the numerical part of the question, about 2,000 boys pass annually through the training-ships, to supply an annual deficiency of between 4,000 and 5,000 men, discharged from various causes, including disease and death.

This numerical loss, though becoming less in proportion every year, is nevertheless continued year by year through the pursuance of a system which, during the past ten years, has diminished the number of seamen—I speak of actual sailors—in Her Majesty's Navy, by no fewer than 20,000 men. Now, although this loss of men is said to be compensated by the two-fold Reserve of Coast Guard and enrolled men from the merchant service and elsewhere, it could not be continued without very great inconvenience, were the navy more actively employed than it is at present.

Not many years since, a reserve of seamen was kept in hand at each of the naval ports, in readiness to embark on any emergency.

By this means the great delay in manning newly commissioned ships was avoided, and the system being still in force when the affair of the "Trent" arose, ships were despatched in a very short time, through the zealous exertions of the officers in command (*e. g.*, the "Orlando," 50-gun frigate put to sea in six days from the appointment of her Captain, Francis Scott, C.B.), whereby great credit accrued to the naval administration for its activity and forethought.

Should a similar emergency arise at this time, I believe the Coast Guard would have to be embarked, for want of any available reserve in the ports.

Should the Royal Naval Reserve be required, it is supposed that about 8,000 men could be at once found available.

Still, neither the Coast Guard—good men though they be—nor the various qualities of men who receive £6 a-year for passing through a periodical training in the use of guns and arms, would supply the deficiency of real active seamen.

It is true that the *quondam* seamen, who have entirely abandoned the sea and followed other trades, are being eliminated from the Reserve as fast as practicable, and their place supplied by men more or less accustomed to the sea, and able to satisfy the official authorities who receive them into the Reserve, that they actually possess a stipulated amount of seaman-like skill. Nevertheless, the qualifications of an able seaman in the merchant service are wholly undefined by law, and many more such men are required to supply the ready activity and the skilful qualities of a far smaller number of disciplined seamen, trained from their youth upwards in the Royal Navy.

Information from various sources shows that the greatly increasing demand for seamen in various quarters of the globe—which has truly been said to have "*grown larger*" within the last few years—will continue more and more to drain our merchant service of men, whom the proffered advantages of the Reserve will scarcely suffice to retain available for the sudden service that may be required of them. I believe it to be a common practice at Liverpool for emigrant ships to evade the law which requires them to carry a crew numerically greater than those of ships otherwise employed, by inserting the names of emigrants on the ships' papers instead of the additional seamen, the persons thus inscribed signing the articles of agreement, and receiving pay at the rate of 6*d.* or 1*s.* per month.

The provisions of the Act of Parliament, if not thus evaded, would demand about 3,000 seamen annually, who would be discharged on arrival at their port of destination, and of whom the majority would enter upon some more profitable vocation.

The reduction in the number of available seamen from these and other causes has led to evasion of the law in the manner described, through the difficulty in obtaining them.

An official return from the Registrar-General of Seamen, completed to 1863, showed that during the previous five years, while the *ships*, the *tonnage* and the total number of *men* in the merchant service had increased respectively as 4, 9, and 4 per cent., the absolute *decrease* in the sailor class during the same period had been as follows:—

Petty Officers	600
Seamen	200
Apprentices and boys	3,000

Making a total of 3,800 sailors lost to

the country out of the merchant service alone in 5 years, being at the rate of 65 per month.

This loss of seamen, added to that which occurs in the Royal Navy, is a very serious matter in a country whose existence may be truly said to depend on the sea which surrounds it.

The increased number of ships during those five years demanded an increase of crew to the amount of 4 per cent., while the tonnage increased in the same period 9 per cent. This increase was chiefly in steamers, for we find the increase of the men to consist of 600 engineers and 1,700 firemen.

Among the sailors, however, we find another kind of increase upon which we cannot congratulate ourselves as a maritime nation, viz., that of foreign seamen added to the merchant service to the amount of 7,500 in the same five years, which represents a daily entry of *four* foreigners against a daily loss of *two* British seamen.

On mentioning this fact to a merchant ship-master of great experience, I was met by the reply that he preferred Swedes, Norwegians, and other foreigners, to many of the British seamen obtainable by merchant ships in the present day.

Another experienced ship-master observed to me on the same subject, "the navy was formerly glad to get what men it could; but now "it has all the best men, and we are obliged to put up with what we "can get."

Surely if this be the character of the supply on which we depend for our Reserve, it is not only important that an abundance of seamen should be trained expressly for the navy, of whom many would join the Reserve after the completion of their term of engagement in the navy; but also that we should employ them afloat in such ships as would keep them in the constant exercise of seaman-like qualities, by which alone can their superiority be maintained.

I will read a passage from a letter addressed to His Grace the Duke of Somerset as First Lord of the Admiralty, by the present Controller-General of the Coast Guard, and by one of the members now representing Liverpool in Parliament, who is also chairman of the Local Marine Board at that port.

Those gentlemen viewed the loss of nautical skill from this country in so serious a light, that they published their letter as "On the national dangers which result from the great deterioration in the seamen of "the mercantile marine."

The writers evidently gave much consideration to the subject, and must have been deeply impressed with its importance, if we may judge by the amount of pains they bestowed on the elaboration of their letter.

Indeed, to find considerations of national honour on the sea, to say nothing of national security at home, made subordinate to the fiscal questions of the day, but little encourages any attempts to press upon public consideration the importance of recruiting our naval force from the condition into which it has settled down, and is still, year by year, settling lower.

Commodore Ryder and Mr. Graves, in their pamphlet, dwell upon

the necessity for seamen to possess certain qualities which they describe as follows:—

“(1.) *A firm footing* in all weathers, at all times, by day or by night, aloft or in boats, which is essential to accurate practice with great guns or small arms.

“(2.) That *bodily activity* which results from constant exercise aloft in all weathers.

“These two qualities combined make our seamen fearless and irresistible boarders. Whatever may be the improvement in artillery, or the progress made in the art of rendering a ship's sides invulnerable, boarding will always remain as a last resource to decide otherwise in conclusive actions at sea and cutting-out expeditions in harbour; and boarders, to do their work effectually, *must* have that agility which on board ship or in boats can alone be found in sailors.

“(3.) That readiness of resource which is largely developed in English lads who love and follow the sea, and enables them when they become men to contend with and overcome difficulties afloat or on shore, and to anticipate or repair accidents with a surprising rapidity.

“These three qualities, when combined with that tenacity of purpose common to all Englishmen, make up the distinctive character of true English sailors, whose presence in large numbers in our future naval actions cannot be dispensed with if we desire to insure victory.”

I may have appeared to some of my hearers to be digressing from the subject announced at the head of my paper. I must, if so, reply that I feel very strongly that one principal merit in the establishment of a class of ocean cruisers, to be actively employed in all parts of the world, would be its effect as an antidote to the listless life engendered among men shut up in iron-clads, so constructed as scarcely to be trusted to move from one port to another without the aid of steam.

If such, then, be the state of affairs with the seamen in the present day, neither are our younger officers trained in such seaman-like habits as was formerly the case.

Not only, in cant phrase, is the “schoolmaster abroad,” but he now reigns supreme *on board*, in his demand upon the time of the young gentlemen under his tuition.

The ships are very few and far between in which lads have any opportunity of becoming thorough seamen, and the consequence is such a low standard in that respect, that I have heard a lieutenant speak of a youngster in commendatory terms, adding, as a kind of make-weight, “and he is very fairly up in his *sailorising*.”

Then, owing to the paucity of lieutenants, these same lads, who are examined and passed with reference to their opportunities of instruction and practice, become in their turn lieutenants in all the responsibility of that rank, without ever being properly “*up in their sailorising*.” I heard of a large ship in the Channel squadron being tacked at night in a manner to cause the captain to remark upon it afterwards to the officer in charge of the watch, and it turned out that he had never in his life put a ship about until required to do so at night, when keeping station in company with other ships.

Now, this is scarcely the state of things we can desire to see in the British Navy, and one great remedy for it, in my humble judgment, would be the employment of such ocean cruisers as I have endeavoured to recommend.

We are approaching to the state of the Spanish Navy, when it possessed, as was said, more admirals than seamen, for we have already more flag officers on the various lists than we have midshipmen. I refer to the Navy List for the numbers, and I find upwards of 320 officers bearing the title of admiral, as against 104 in the rank of sub-lieutenant, besides those who may be acting in that rank, and from amongst whom many are doing the duty of lieutenant.

The lieutenants, I find, are 20 per cent. below their established number, and it is from the trifling number of sub-lieutenants that the deficiency has to be made up.

Give us active cruisers, again I say, to restore a seaman-like spirit, skill, and activity among both officers and men. It is not yet too late, but who shall tell when it may be! and when the time of trial comes, little will it avail to seek remedial measures.

The classes of ships recently constructed in America would give employment to real seamen, some of whom being always in reserve in naval barracks, would be at hand to form a nucleus for manning with the Coast Guard and Naval Reserve those iron-clad ships destined to form the squadrons for home defence on any emergency.

If the colonies maintained a sufficient naval force for protection of their coasts—which it is nothing but an impossibility for this country even to *attempt* to do for them—then the number of ocean cruisers might be reduced in time of peace, and a reserve of such ships maintained in readiness at home, could, in event of war, be fitted out by degrees as the enrolled seamen returned from abroad, at the estimated rate of 1,000 a-month, besides which, we may count for something the enthusiasm displayed, by the Northern seamen especially, at the time of the “Trent” difficulty.

It needs little argument before a professional meeting of this description, to establish the superiority of copper-bottomed ships for lengthened service in distant seas, over those of steel or iron.

In a lecture delivered at this Institution by Commr. F. Warren, on 20th March last, the annual expense of docking and varnishing the bottom of an iron ship of 3,700 tons, is stated as £677 2s. 8d., while the increased expenditure of steam-fuel consequent upon the foulness of such a bottom, so prepared, after less than six months’ service, amounts to more than 25 per cent.

Considering the cost of coal on distant stations where this increased expense may be supposed to arise, this increase amounts to a very large sum upon even our iron troop ships alone.

In the “Megæra,” for instance, whose best speed is 10 knots, her progress, whether under steam or sail, was impeded 1·5 knots per hour after only three months’ service, and double that amount after six months.

Apart from the decrease of efficiency for general service, and large increase of expense, we have to consider the positive risk of losing a

ship, under circumstances where this loss of motive power, whether expressed in speed or fuel, added to possible unmanageableness in consequence, might tell most fatally.

It appears, therefore, a *sine quâ non* that ships for lengthened and distant and foreign service—and especially in time of war—should be free from the many objections which must ever attach to an iron bottom.

No substitute of any real merit among the many contrivances tried or suggested, appears likely to supply the good qualities of the old copper bottom.

An iron clipper ship has been very successfully coppered by Messrs. Austin, of which the details have appeared in the public papers.

I have been told by a friend of the owners, who have patented their method of sheathing, that although no other shipowners have been induced to follow in their footsteps—probably deterred by a question of royalty on the patent—yet they (Messrs. Austin) have been remunerated for the expense incurred, by the two first voyages of their ship, whose displacement and consequent carrying power have been so largely increased.

Of course the ratio of displacement to propelling power has to be considered in constructing a ship on this principle of a wooden sheathing outside an iron bottom. But this is a trifling problem in the hands of a constructor.

The bottom of the ship has been tested by the removal of portions of the sheathing, and in all those places, as I am informed, the insulation of the iron has been so complete as to have perfectly protected it against the destructive effects of the copper.

Finally, then, let these ships with steel frames, inside skins, wood-planking,* and coppered bottoms, be provided with iron masts of great strength, and of large diameter, to withstand the effects of shot; let those masts be, as far as possible, independent of their lower rigging for support, by being built into and forming part of the ship; give them cap topsails and long mastheads, and I believe they would combine the qualities required for long cruizes, beyond any other description of vessel yet produced. Fit them either with twin screws or else with feathering single ones, and balanced rudders, arm them with a few of the heaviest guns upon whose soundness you can rely, with some howitzers in addition for use at close quarters; let them carry, perhaps, an iron belt above and below the water-line, but certainly an iron inner skin, and divide their holds into water-tight compartments, and they may go forth in confidence to seek in vain for their superiors and to find their equals if they can. Such ships will, at the same time, increase the efficiency of the navy in quality of material, while also keeping alive the spirit of true seamanship among both officers and men.

To resume shortly the purport of the present paper.

I desire to advocate especially three great principles, namely, the

On the Clyde, these union-built ships are constructed with diagonal planking in two thicknesses crossing at right angles, *planed*; they cost less than £18 per ton. This would be too cheap for the Royal Dockyards.—W. II.

adaptation of particular ships for particular duties; that the ships of each class should be as nearly as possible consimilar: and that *speed*, with an armament of large calibre should be the principle pervading all classes of ocean-cruizing ships.

Secondly, I would urge the importance of constructing, without a moment's loss of time, as many as the country will consent to grant, of ships on the pattern of the large American corvettes.

Thirdly, that such ships should be the means and the occasion of keeping on foot a greater number of *bond-fide* seamen in the Royal Navy, whose expense could well afford to be deducted from that of the Royal Naval Reserve.

Such men would be of too great value to be inconsiderately cast aside at the price of one farthing or less in the pound, of income-tax, and the Coast Guard should be maintained on an *increased* footing for their reception, not only for the sake of keeping on hand a Reserve very superior to that of the mercantile marine, but above all for the avoidance of that baleful evil which has so often arisen out of Parliamentary parsimony, namely, the want of good faith towards our seamen.

The more active employment of our officers would not only be a boon to them, but such employment as the class of ships which I have endeavoured to recommend would afford them, would prove an antidote to the prejudicial effect which the use of steam, in ships fitted out beforehand, has had upon the practical seamanship of almost every class in Her Majesty's Navy, as well as in the mercantile marine.

Nor these points only, but in event of war, we should be in a suitable position at sea to resist the depredations upon our commerce and our colonies, which will, in future conflicts with other countries, occupy the place of the great naval actions that adorn the history of Great Britain.

APPENDIX.

A LIST OF THE IRON-CLAD NAVAL FORCE OF EUROPEAN NATIONS OTHER THAN GREAT BRITAIN AND FRANCE.

Taken from "Statesman's Year Book" for 1866, and from other sources.

ITALY.			PRUSSIA (Scheme).		
	Guns.	H-p.		Guns.	
4 Frigates each	36	900	10 Frigates	250	
7 "	26	700	10 Turret ships	40	
2 Corvettes "	20	400	8 Corvettes	224	
2 "	12	300	6 "	93	
2 Gun-boats	5	150	—	—	
1 Cupola ship	2	700	Total 34	607	
18 ships	403	10,900			

In addition to the above, the sanction of Parliament has been obtained for the construction of 4 other iron-clads. — *Quarterly Review*, October, 1865.

RUSSIA.		
2 Frigates.		
22 Corvettes.		
1 Clipper.		
3 Batteries.		
11 Coated gun-boats.		
14 Plated batteries.		
—		
53		

AUSTRIA.		
	Guns.	H-p.
2 Frigates each	52	800
3 "	31	650
2 "	28	500
—		
Total 7	213	4,550

SPAIN (Scheme).		
	Guns.	H-p.
3 Frigates	104	3000
By decree of April, 1860.		

DENMARK.

4 Iron-clads.

NETHERLANDS.

Unknown.

TURKEY.

9 Iron-clads.

N.B. — Different States in South America are also providing iron-clad ships of war.

Admiral HALSTED: I would merely observe, upon the statement regarding the number of guns in our iron-clads as compared with the number in the French iron-clads, that Captain Horton has included all our guns, as if they were all under armour. I do not think he has made the distinction between armoured and unarmoured guns.

Captain HORTON: They are the guns carried by armour-clad ships.

Admiral HALSTED: In the case you quote, of the "Black Prince" and the "Warrior," instead of 41 guns under armour, they have only 26. I see the "Defence" and the "Resistance" are put down in the list for 16 guns: it should be 14, they have only 7 broadside guns under armour. The "Achilles" has only got 11 under armour, double broadside 22. If you take this point into consideration, you will see that we are much worse off, as compared with the French, than you have represented. What I am stating is rather an addition to your unfavourable comparison. I would merely add, that I fully agree in all the general remarks you have made. But when you say your wooden ships have an inch skin of iron, they are in truth ships of iron, and not of wood; in which case they may stand the effects of the machinery, which is necessary to give them high speed; but ships of wood could not sustain those effects. I do not believe we possess a single armed ship of wood which could really and truly put forth her powers of high speed, up to anything like 2,000 horses and upwards for any continuous period in time of war. There is no such thing in existence as a screw-ship at the present moment in the merchant service built of wood, as the result of *bona-fide* experience. They have all gone to pieces; and ours in the Navy would go to pieces too if they were really put to proof. But the fact is, we do not, in time of peace, continue running them in the way, in which they would be required to run in time of war. However, your proposed combination of an outside skin of wood, and an inside skin of iron might answer. I did not understand whether your frame was proposed to be inside or outside that skin of iron. To do any good, it should be inside in order to support the skin. Then, again, how are you going to apply your wood? I believe the Americans themselves would build of iron, and would armour their iron ships as we are doing, in most cases, but they have a great excess of wood and very little experience in the construction of iron.

The CHAIRMAN: How would you dispose of the difficulty of the bottom?

Admiral HALSTED: I do not believe that it is a difficulty, for this reason; I never accept anything as difficult where sufficient means have not been tried to get over it. Its existence at the present moment can be got over in the case proposed by Captain Warren; again, in the case proposed by you; again, as proposed by Mr. Grantham; and so far back as the lectures which I delivered here in 1861, showing precisely the same evils, a national effort was suggested. It has long become a national question, involving a national effort to get over it. I have noted here a remark of Captain Horton, that the system of fouling is inevitable with iron bottoms. But if I understand him aright, he immediately afterwards quoted vessels of Messrs. Austin—I think that was the name—where the fouling had been got over.

Captain HORTON: I beg your pardon; one ship has an iron bottom, and the other has a copper bottom exposed to the water, no matter what she has inside.

Admiral HALSTED: I do not quite apprehend the difference which you have made. At any rate it is perfectly certain that there has never been any national effort made to get over the very great evil which you have described. The special talent of the country, qualified to meet a difficulty of that sort, has never been appealed to. It would be worth while to expend any number of tens of thousands of pounds of the public money, for the purpose of really constituting a committee of the ablest men to take up the question nationally. Up to the present moment, it has been left in the hands of individuals, who have been excited by their individual interests to attempt it. But there has never been anything like a connected system, or attempt made of a public nature, to get over it. Let me revert to a circumstance which occurred many years ago, when screw-ships were first introduced, and when the projection of the screw shaft under water was the then means for connecting and disconnecting. The screw shaft projected beyond the stern-post, and was exposed to the action of the copper. At that time it was found that Muntz's metal was the material which was least

productive of the galvanic current; and so far back as the days of the "Amphion," in 1846 and 1847, it was proposed to make all the stern portions of the ship, including the stern-posts and the rudder, of Muntz's metal. Ships at that time were ordered to be sheathed with Muntz's metal, on account of its materially decreased effect as a galvanic power. The ship I commanded was so sheathed. The object is so important, that there is no reason why Muntz's metal itself, thick plates of Muntz's metal, should not be substituted for iron plates. To give you an idea that such a thing has been practically contemplated, I may say that not many years ago, it was made the subject of a patent. Upon an estimate it would have cost for a ship of the size of the "Warrior" about £30,000 more, to have constructed all her lower parts and her outside plating entirely of Muntz's metal. I do not at all believe that there is any permanent difficulty about the business. I never admit that difficulties do exist to this great extent, unless they have been fairly, and to an equal extent, attacked by those who are competent to deal with them. I give you great credit for the way in which you have drawn up your paper. I believe you have done a great public service by so doing, and I am very happy to state my opinions thus publicly upon the matter.

Captain ROSEASON, R.N.: It is with much pleasure that I rise to say how much gratified I am with the paper just read. I cannot say that I agree with Captain Horton in every particular, but as a whole I have listened with much pleasure to every word that he has read. Captain Horton has dwelt upon the importance of speed; but there is a view of this question which has seldom been taken by the majority of the profession. We all know that the horse-power required, is as the cube of the velocity. To enable me to illustrate this, I will take simple figures. I will take 10; the cube of 10 is 1,000, and the cube of 8 is 512, or about one-half the cube of 10. It is thus seen that to pass from 8 knots to 10 knots requires double the horse-power. All parties admit this, but few think of the reverse. If a gale of wind drives the speed of a vessel down from 10 knots to 8 knots, practical experiments over thousands of miles, as well as theory, tell us that the vessel thus reduced from 10 to 8 will maintain an average of about 8 knots, while the vessel with a maximum speed of only 8 knots will, in the same proportion, be driven down to nothing. I do not know whether I have made myself clearly understood? (Yes.) You will thus observe the importance of obtaining the average speed of a vessel as shown by her runs in the open ocean, subject to heavy seas and winds, and not be content with any comparison obtained at the measured mile in smooth water. Admiral Halsted has alluded to the fouling of the bottom in iron vessels. That becomes an ingredient in the speed, for when that foulness takes place, the advantage derived from a higher power is effectually destroyed. When I was in the East Indies, Captain Potts came out from England in command of the "Malta," a fine new iron steamer, belonging to the Peninsular and Oriental Company. He, like every sailor, was in love with his own ship, and stated the high average speed that his steamer had maintained from Singapore to Hong Kong. I believe the speed stated was 12 knots an hour. I had always reported the "Inflexible" to be a slow boat, considerably underpowered and undermasted. The Admiral asked me if I could "beat that." "Oh, no," I replied; "if the 'Malta' has averaged that speed, the 'Inflexible' cannot beat her." We had a trial of speed, however, before the "Inflexible" left the station, in a run from Hong Kong to Singapore, and thence on to Bombay, against the south-west monsoon. You must bear in mind the advantage the "Malta" possessed in having every arrangement made for immediate coaling on her arrival in port. I had to land, and to make every arrangement subsequent to my arrival. Nevertheless, I beat her eight days on the run to Bombay. The advantage I gained over her was two days in the smooth water between Hong Kong and Singapore. It was the foulness of her bottom alone, I believe, that enabled me to beat her to that extent, as was shown when she went into dock at Bombay. On the other hand, when the "Inflexible" was taken into dock, after having been in commission eighteen months, and just after making a run of 9,000 miles from New Zealand, her bottom was perfectly clean. It is important to state that three vessels ran in this race—the "Malta," the "Inflexible," and the "Fury." All started within a few hours of each other, and encountered the same weather.

Both the wooden vessels beat the iron vessel in this decided manner. The "Inflexible" had an advantage over the "Fury" in this portion of the run of half a mile an hour. The latter did not go beyond Singapore. Now, in the construction of these magnificent vessels, which are said to cost from £250,000 to near £400,000, I think there ought to be some more experimental trial than the measured mile in England. They ought to be tried over given distances in the open ocean, where alone the true average speed can be obtained. Some of the large iron-clad steamers on Captain Horton's list appear to have a very low rate of speed. If this is the result of their trials at the measured mile they will most likely fail to make even a mile of headway when encountering adverse winds, and a heavy head sea. I read lately in a daily paper that an official in the French Marine had reported that some iron-clad vessels lately launched had suffered so much from corrosion, that he anticipated they would require to be replated every five years. I cannot say if this statement be true or false. It is, however, no argument against the construction of these monstrous vessels. We must have them so long as other nations have them. At the same time let us build vessels such as are proposed by Captain Horton, that will do the duty which the "Alabama" did—paralyse the whole commerce of the enemy, and protect our own. I entirely agree with Captain Horton that each class ought to have a speciality. Vessels of certain classes ought to be built for certain specified objects, and it ought to be clearly established by experiments obtained over given distances in the open ocean, that they can fulfil every condition of the class for which they are intended. Our imports and exports last year were 444 millions, and this year will be close upon 500 millions; and, certainly, we ought to have something to protect those vast commercial interests. (Hear, hear.) We are fully in a position to protect our own coasts, but let the Administration say, if war were to break out to-morrow, whether we should be able to protect our vast mercantile marine from the attacks of an enemy.

Mr. A. F. RIDGWAY: There is one point which Captain Horton touched upon which I think of vast importance, and that is in regard to our colonial defences. There is only one of the colonies which, as yet, has attempted to have a navy, and that in a very small way—the colony of Victoria. There was a ship built here, and sent out to that colony a few years ago. The gentleman who has just sat down spoke of New Zealand. In New Zealand the necessities of the war have called up the energies of the colony in ship-building, and in manufacturing steam-ships. I am very glad to see by the papers which arrived recently that a vessel built for mercantile purposes, named the "Tasmanian Maid," bought by the Local Government, and christened the "Sand Fly" and other vessels that were employed in the service of the Government in the late operations have been well supplied with coal raised in the colony. There have been immense discoveries of coal in New Zealand, so that ships employed by our Government out in those colonies could be well supplied with coal. Then, there are very large deposits of iron-sand all along the coast, which parties are now setting to work to bring into the shape of iron; so there is no lack of iron to build ships of war. There are a great number of places on the coast where ship-building can be carried on extensively. A great many shipwrights from Newcastle-upon-Tyne and the northern ports have gone to New Zealand, and the building of ships is becoming a considerable trade. The vessels that run into Sydney and Auckland are several of them of large size.

Captain JASPER SELWYN, R.N.: I think, Mr. Chairman, I must claim a few minutes to speak on one or two principles which Captain Horton has so very ably put before us. His paper has been so comprehensive that I think every one will agree with me that it deserves a longer discussion than time will permit. However, it is necessary that we should look at this formidable array of a foreign navy in all the lights, if possible, to which it may be subjected. I confess that in his beautifully arranged list of French vessels of 900 horse-power all through, and of 16 guns, I see something which reminds me of that dead level of mediocrity which is generally the result of a settled plan closely stuck to. Whereas in this country, although we have committed very great errors in armoured ships, and I have been among the very first to admit it and to point it out, yet we are going forward; while the French appear to have limited themselves to a type which they conceived, and which they

are prepared to defend, as being perfection. When I remember that a ship which I do not see in the list, the "Hercules," has advanced to nine inches of armour, and with a probable speed of not less than that of those which now carry the very inefficient thickness of four and a half inches, I think we may say that we have made an enormous advance, and one for which uniformity may very well be sacrificed. If we can go forward in that direction, if we can obtain a still further advance in the use of steel for the hull, which gives us the power of carrying so great a weight of armour without unduly diminishing the speed or the other qualities of the ship, I think we are bound to do so. If, again, we only consider the difficulties of the galvanic problem, which has not yet been attacked as well as it might have been, but which is in process of solution, we shall find that much remains to be done before we reach the limits of the advances that we ought to make. I see one Officer of the Royal Navy present who has attacked this problem with a large measure of success; and I know several other inventors who do now practically prevent fouling and the decay of the iron. They do it by the adoption of a two-fold principle. Where you desire to prevent fouling there must be a slow decay of the surface; and where you desire to prevent decay of the bottom, some other material, the application of a pigment to the outside, must be resorted to. In these two things the necessary conditions will be obtained. The bottom will not decay, because you have arrested the action of the galvanic current; and fouling will not take place, because you have provided against it by a process which will prevent the adhesion of grass and barnacles. The answer to the proposition for the establishment of an un-armoured class of vessels may be found in the fact that we possess already such an un-armoured class of vessels. If we desire them, we have a merchant navy which we could arm with such few guns as may be necessary, and which we could employ satisfactorily without premitting any of the advances which we are making in iron-clad vessels, which are an inevitable necessity where fleets are to act against fleets. It would be very unsatisfactory to an officer of the British Navy if, finding himself in command of an unarmoured vessel, he was opposed to one of those wretched little armoured tubs, which it would not consort with his dignity to run away from, and which he would fight at an enormous disadvantage. (Hear, hear.) The question of changing ships which Captain Horton has spoken of is one which he may not have remembered would introduce much more of that undesirable material, foolscap, which has come into the navy in such floods of late years. I doubt very much whether any set of Admirals could keep their brains under the strain which would be thrown upon them by the constant change of ships, officers, and everything else connected with their command. I do not agree with Captain Horton's views about the turrets. I believe these turrets are excellent things in their place; but that they will compete eventually with broadside armoured vessels I do not believe, for this reason, amongst others, that although a very good show is made when turret-ships are only pleased to fight one side, and all their guns are pointed on that side against a single enemy, yet when it comes to a fight with both broadsides that is quite another affair. Then the weight of metal thrown is by no means equal to that that would be thrown by a broadside armour-ship. Also, because in the necessity of the case, the ship requires to be armoured as well as the turret; therefore, you are devoting one special armour to the guns, and another special armour to the hull. We might have cause to take a gloomy view if we were once to admit that the superiority of the French and American navies was so far established as these figures tend to show. In the case of the French navy, I think, we should have cause for doubt and distrust; and with regard to the American navy, we should recollect that they, like ourselves during the Crimean War, built a very large number of vessels for the special purposes of their war which would not be of the slightest importance as against us; and that the question of the "Alabama" and her consorts reduces itself to this—that any nation, not possessing any navy whatever, never having had a navy previously, the Chilians at this moment possessing three or four ships only, may, by sending one fast cruiser to sea, whose mission is not to be caught, but to catch the commerce of the enemy, send up the rates of insurance in the country against which the attack is made, and her flag disappears from the sea. It is not because all the ships belonging to the country attacked will be caught by that vessel, but it is because any of the

ships may be caught by that vessel, therefore the rates of insurance go up; and it is felt better not to send your own ships to sea, but to put your cargo under the flag of another nation. With regard to the twin-screw system and turrets, I must also beg to remark that in this Institution two of its distinguished members have been respectively the consistent advocates for some years past of these two things; but I do not think it a compliment to them that their efforts should be taken hold of by a department of the State, without acknowledgment of any sort, be called by another but slightly altered name, and brought forward as the unaided efforts of the genius of that department. I hope the country is of opinion that whenever a man has proved his point fairly, after the very great discouragement which all inventors meet with in this country in their first efforts, that he does then deserve to be publicly recognised, and not to have his efforts stolen from him, or abstracted from him in any sort of way. I hope that what we say in this Institution will be so far re-echoed as to convince those gentlemen who have the management of these affairs that their best policy is to seek for and openly praise that talent which they may often find by applying to the members of the sister services for their ideas on points in which such men are most experienced, and in which some among them have shown special knowledge, and have taken special interest.

Mr. E. J. REED, Chief Constructor of the Navy: I am not quite aware of the exact purport or intention of the last remarks of Captain Selwyn, but I quite concur in the principle that when you can trace an invention to an individual inventor it is a duty to reward that inventor. Captain Selwyn's remarks have very much taken away the ground upon which I was about to stand for one or two moments in speaking of Captain Horton's paper. It seems to me not at all likely to influence public action wisely when comparisons between the navies of this and other countries are introduced on an unfair basis, or a basis which we should not recognise as a sufficient basis for comparison, when dissimilarities in vessels, dissimilarities in power, dissimilarities in armament, and dissimilarities in tonnage are adduced as necessary disadvantages. Captain Selwyn has already pointed out that the uniformity in the French navy points to something like mediocrity. I think we are scarcely furnished with the funds necessary to pursue uniform systems with the improvements which are continually taking place in guns and ships. I am not at all prepared to say that the full amount of desirable uniformity exists in our ships, but I do say that some of the greatest dissimilarities that exist between them are due to justifiable causes. I will instance one or two cases. Among the list of first-rate ships on the wall we find there are ships which are dissimilar only because a recent change has not come under the notice of Captain Horton. I think the "Northumberland" will have a less number of protected guns than the other two vessels of her class. Now, why will that vessel have a different number of guns? For this reason, that the ship has been a long time in building, while armour plating has increased in thickness, and guns have increased in power, and it was deemed advisable to avail ourselves of the backward state of that ship to place upon her thicker armour, and an increased calibre of guns in her battery. Now, I can hardly imagine any officer of the navy censuring a change of that kind, unless it involved an objectionable principle in construction. I merely say that the discrepancy that will exist between the thickness of armour of that ship and of other ships of her class, and the difference between the armament of that ship and of other ships of her class, can hardly be made a ground of complaint. I hardly think we should be in a better position if we had adhered to the ideas which prevailed at the time she was begun to be built. More than that, I am disposed to think that, when vessels with a very large increase in the thickness of their armour, and a very large increase in the power of their guns, are brought against vessels with smaller guns and less armour, as in the French navy, that they will produce the same consternation as an armour-plated ship would originally have produced among a fleet of non-armoured vessels. It appears to me that it would be deplorable if the weight of an Institution like this should be given to impede the efforts made by responsible persons to increase the power and efficiency of our ships. Again, I may point to the circumstance that mentioning the nominal horse-power does not point to a considerable discrepancy of speed or power. I will illustrate that remark in this way: In the case of the "Lord Clyde," which you find

of the same nominal horse-power as the "Prince Consort" and the "Caledonia," her engines are upon a new principle which develops a larger power than the engines of other ships. What is the consequence of that? That by virtue of that increase in effective power, though of the same nominal power, that ship is enabled to carry five and a half inches of armour at her water line instead of four and a half, and an extra inch and a half over her gun deck; her armour also extends further beneath the water, she has higher ports, and it is supposed she has other advantages in comparison with other ships of the same nominal power. Now, I submit whether any one would be prepared to maintain that the "Lord Clyde" is a worse ship because she has a different type of engine, which enables us to give her increased weight of armour and increased weight of guns—worse for no other reason than that if you compare her with other vessels of the same nominal horse-power she differs from them in armour and guns. Again, with regard to the armour of the French ships, it is perfectly evident that if the efforts made in this Institution and other places to improve the power of guns, which is more or less associated with the increase of weight of guns,—if these efforts are right there is only one way of utilising the ships you have, that is, by putting into them guns of increased power with a less number of them. Ships are things that you cannot put guns of twenty tons in place of guns of ten tons into, and have the same number of them. I think it is hardly a fair ground of censure that you have been putting ten guns in one ship, in place of twenty in another, when you have been increasing the power of that ship by putting in guns of larger calibre. Then, I think it is unfair to say that the French navy is a superior navy to our own. While they have ships uniformly armed with guns that fire a low charge of powder, we are arming other ships with guns that fire 50-lb. charges of powder. I consider the uniformity is a uniformity of mediocrity, a thing not at all to be desired; and I think we may congratulate ourselves upon the fact, that in this country we have been enabled to increase the power of our ships, even if with some disregard to mere uniformity of figures. I should like to make another remark which is only fair to the navy; that is, that those ships given on the board are not so dissimilar as represented. The "Caledonia," the "Ocean," the "Prince Consort," the "Royal Alfred," and the "Royal Oak," are all built from precisely the same designs. The three ships, "Caledonia," "Prince Consort," and "Ocean," are as much alike as three ships can possibly be. They differ from the others in the amount of their power; and recently the "Royal Alfred" has been made different from her consort by the substitution of thicker armour and larger guns. But those three ships which have precisely the same power are to all intents and purposes alike. Everybody knows the "Warrior" and "Black Prince" are substantially alike; and if there is any discrepancy in their armament, it is only because you cannot, with the improvements that are going forward, produce the new guns so quickly as to put them into every ship. Some remark has been made about our ships not being adapted to work in squadrons. In a letter which I wrote to the *Times* newspaper two or three years ago, I showed that there are a large number of these ships perfectly capable of working in squadrons. But vessels built alike often differ much from each other. The "Scorpion" and "Wivern" appear to be exactly alike. They are the two turret vessels supposed to have been built for the Confederates by Messrs. Laird; those vessels are built from the same designs, yet the "Scorpion" and the "Wivern" differ half a knot in speed. Everything is alike in other respects. I have not with me the speeds of all those vessels mentioned, but if you were to group them you could put them in speeds differing not more than from half a knot to a knot. It would be useless to think of improving the speed of our ships if a difference of a knot or half a knot is to be considered an insuperable objection to the working of our ships in squadrons in time of war. There was another remark made by Captain Horton. He has discussed the question as if we had no ships at all capable of crossing the seas and disposing of such powerful vessels as might be sent against our navy. I fully agree with Captain Horton and the other gentlemen who have admitted—and people are obliged not only to admit, but to feel with great pain sometimes—that the iron ships are subject to more or less diminution of speed; but any one knowing those vessels must be aware that ships like the "Warrior," the "Black Prince," and all

those larger vessels are just as capable of making a voyage across the ocean, and of doing, in fact, all that the un-armoured vessels could do, as any vessels which we might possibly build. I do not say this in depreciation of Captain Horton's main points, because I am very much impressed with the desirability of building everything in advance of what has been done before. It seems to me a legitimate use of the wealth of this country to learn what other people are doing, and then, if possible, to make everything in advance of them. I shall not, perhaps, be exceeding what is allowable under the circumstances if I mention what Captain Horton has not been at liberty to mention, namely, that the construction of a class of vessels, such as he has been projecting, has been seriously entertained. But, unfortunately, there are great difficulties in the way. You know perfectly well that it is not an easy thing to build a vessel to steam 15 knots. One of the American vessels mentioned this evening by Captain Horton has been put forward by the builder as capable of 15 knots. The American Government, however, do not believe in her. They have undertaken to pay the builder in full for the vessel if she will make 12 knots an hour; and they have, moreover, undertaken to pay him in proportion to the cube of the speed between 12 and 15 knots, so little confidence have they in the statement. There is one general consideration which ought not to be lost sight of,—that neither the French ships nor the American ships have engines equal to the engines in English ships. The American engines are much heavier than ours; and it is chiefly on paper in this country that they steam their vessels at very high speeds. We could do the same if we chose. I think no dependence can be placed upon figures on paper as to the speed of their vessels. It should be borne in mind that every ship built by the Admiralty is subjected to the severest trial of speed on the measured mile, which I agree is not and ought not to be a final trial. But it is a desirable trial, because it gives you comparative capabilities. I should have been glad if those vessels in the French navy which are said to steam at a speed superior to ours could have had a race with some of our vessels at the international meeting at Portsmouth, the "Magenta" with the "Warrior," for instance. My own opinion is, that the French vessels do not equal ours in speed; yet, on the other hand, I must say that I believe the deficiency in speed would in many instances be compensated by the extreme handiness which the shorter vessel has. However, I do not think it fair to lose sight of the fact that these general representations are exaggerated with regard to the speed of vessels of other nations; and that the American vessels have yet to do the extraordinary speeds of which we have heard so much. I hope my remarks will be taken in the spirit in which they are made, in the spirit in which this Institution promotes the discussion of these questions. I am sure that Captain Horton will feel that in making them I have no desire to detract from the main value of his paper. On the contrary, I am very glad to find that officers of his ability and experience do contribute their views on these important matters. But I think naval officers would do extremely well, if they wish their words and facts to have weight with the State, to take pains to analyse their facts and figures, and give us a basis for everything they say, on which we can proceed practically.

Captain HORTON: I am obliged to Mr. Reed and other gentlemen for such concurrence as they have expressed in the views I put forward, especially as my object is to advocate the preparation, which Mr. Reed has kindly informed us is under consideration, of un-armoured ships. They may fail as much as the American ships have failed; still, what I wish is, that the attempt should be made to produce a class of ships competent to cope with those which are prepared in America with a definite object, namely, the destruction of our commerce. We, on the other hand, should be capable of protecting our commerce against such depredators as they might turn out. The commerce of this country with our colonies, on the high seas constitutes one of our weak points. With regard to the figures I have put on the board, I stated in my paper that I was under correction; that they were put there for the purpose of comparison; but I cannot vouch for their accuracy. Mr. Reed has the advantage of knowing facts which are foreign to me. I have merely taken them from such documents as I can find. The French ships I have illustrated in that table possess an uniformity, from which they appear to have a great advantage in squadron sailing, of which our ships see so little in the present day. It is satisfactory to learn that so

many of our ships are so nearly alike. I have counted the varieties which do exist among them, and I find there are eleven classes in respect of guns, ten classes of horse-power, and nine classes of tonnage. Among those there may yet be great uniformity; and if Mr. Reed will kindly indicate to me those which form the same kind of squadron, it may be of great interest and value to the meeting.

MR. REED: The first six would go together in point of speed, down to the "Black Prince."

Captain HORTON: Did you not mention four of the wooden vessels?

MR. REED: The "Caledonia," the "Lord Clyde," the "Lord Warden," the "Prince Consort," the "Ocean," those five; and several others might be named.

Captain HORTON: Then we may congratulate ourselves upon having two squadrons of powerful ships. The stronger they are the better. I am not an advocate for mediocrity, but for improvement, though not simply for single vessels being improved in their good qualities, but also for those of inferior quality being improved up to a better standard. With regard to my idea of the "Union" form of building, they are ships composed of steel frames. Inner skins also, wood planking, steel beams, and steel decks would be a great protection to our crews. Captain Selwyn mentioned the possibility of fitting out merchant ships. Ever since the Peninsular and Oriental Company was founded, and the West India Mail Packet Company was formed, it was one of the conditions imposed upon them that their ships should be capable of carrying guns. But, surely, those are not ships that would be sent forth on a long cruise to contend with the American ships of which I spoke. I do not advocate wooden ships or any particular form of ships, but simply a general principle. But I think the transfer of the commerce of this country from our own to a foreign flag would be about the most miserable condition of things this country could ever witness; not only unfortunate for our position as a nation, but it almost implies starvation. We should hardly get things from our enemies—supposing we were at war with America; and had to rely upon foreign flags—unless it were that our own ships were transferred to foreign flags, and I think we should be scarcely well off in that case. Mr. Ridgeway favoured us with information that the colony of Victoria is setting an example, which I hope will be quickly followed by other colonies, that of forming a navy. That is a question of state upon which I merely touched. With the professional topic of ships I am more capable of dealing. I do not know that there are any other objections raised which require a particular reply. We are told that certain things are in progress, as also certain measures for protecting ship's bottoms against corrosive decay and against fouling. We do not possess these things at present; but we do know that copper sheets do protect ship's bottoms against fouling, and I think we should avail ourselves as far as possible of things existing rather than of those in prospect.

The CHAIRMAN: I would take this opportunity of relieving Mr. Reed's mind by stating that this Institution is not embarked in any desire to foster or forward any wrong opinions. It is distinctly stated on the outside of the journal that the writer of every paper is responsible for his own opinions. The members of the Institution are not at all committed to them. The writer states his own opinions here, and then they are open to be objected to by anybody. Everybody is entitled to take objections. This regulation is made in the hope that discussion will be brought about. We sometimes like to see an adverse paper, although the generality of us may not be favourably inclined to the views contained in it, for the very purpose of elucidating what is the truth. I confess I think Mr. Reed is very hard on the writer of the paper, inasmuch as I did not understand the object of it was to set forth the superiority of the French, but merely to advocate one simple principle. He was not contrasting ship with ship, and saying that the English ships were inferior to the French, but that in them there was system, design, which it was desirable to have, for ships acting in squadrons. Mr. Reed must be very sensible that, in case of accident, to have a number of ships in squadrons and all these ships with different kinds of engines, and different in their construction in every way, is, of course, a disadvantage. I only understood Captain Horton as taking that view—(Captain HORTON: Simply)—as desiring to have a fixed pattern; not at all advocating mediocrity, but progress; and that as a main feature—for that in reality was the main object of his paper—advocating that class of

vessel that he enlarged upon, which the Americans are building, and which Mr. Reed admits is now in course of construction, thus recognising the principle. Captain Horton dwelt upon that, and Mr. Reed admitted it. I do not know that anybody here except Captain Selwyn spoke of the introduction of steam-packets.

Captain SELWYN: Not steam-packets; vessels fitted for such a purpose.

The CHAIRMAN: To take the ordinary packet-ships from their regular service I think would be a very great injury, not only to trade, but to the postal arrangements of the country.

Captain SELWYN: Pardon me; I said that in our merchant navy, not confining it to the great Steam-packet Companies, or any particular class of vessels; there are such vessels to be had if you advertise for them.

Captain ROSEBORO': May I allude to what you have said about these ships? I happened to be out in India when a secret order came from the Government to the Peninsular and Oriental Company to arm their vessels. I was the only naval officer there, and I found the greatest possible difficulty in making those ships available at all.

The CHAIRMAN then proposed the customary vote of thanks to Captain Horton for his paper.