

to protect all a ship's guns with armour but only the principal ones. (6) A ship, as a rule, can only bring half her guns to bear on the same fort, *viz.*: those on the engaged side. (7) She can't carry so much ammunition. It is necessary that Garrison Artillery officers should have a considerable knowledge of foreign war-ships. There is not much use studying the ships of our own navy as, unlike our friends in Chili, we do not anticipate ever having to engage them; but the ships of other nations should be closely studied, and officers of the R. A. at home are instructed in all that can be taught about the navies of France, Italy and Russia, as affording distinct types. The United States Navy is not at present considered, but as soon as our American cousins have finished the fine vessels they are now laying down or constructing, such as the *Indiana*, *Massachusetts*, *Oregon*, *Puritan*, *Terror*, *Miantonomah*, etc., it will, I think, have earned for itself the right to be studied with those of European nations.

#### RECENT IMPROVEMENTS IN NAVAL ARCHITECTURE.

I have said that Garrison Artillery material has been revolutionized of late years, and the same remark applies to the navies of the World. I don't suppose there is anyone in this room who is not aware of the changes which have taken place in naval architecture from the days of the old wooden three-deckers to the time of the present armoured first-class battle-ships. Now we have vessels carrying guns of 100 tons weight with 24 inches of armour. It seems to be a kind of competition between the gun-manufacturers and the naval architects; as soon as a gun has been made that can pierce the heaviest ironclad afloat another ship is laid down with thicker armour, and then another more powerful gun is made to pierce her, and so it goes on; but the advantage should lie with the gun-manufacturers in the end as there seems to be no limit to the size of a gun, whereas the ships can't be made quite solid!

#### TYPES OF SHIPS.

The following are the different types of ships to be met with:

Different types—Battleships, 1st, 2nd and 3rd Class—Coast Defence Ships.

Cruisers 1st Class, armoured.

“ 1st “ protected.

“ 2nd “ “

“ 2nd “ partially protected.

“ 2nd “ unprotected.

“ 3rd “ protected.

“ 3rd “ partially protected.

“ 3rd “ unprotected.

Sloops, Gun vessels 1st and 2nd class, Gun boats, Despatch boats, Torpedo boats, and ships of special type.

The above is the classification of ships in the British Navy.

To have a complete description of a ship the following information should be known:

History of Construction—date and place commenced or laid down. Dates of proof trials. Date of completion.

General Appearance— including any points by which she may be recognized.

Hull—material; constructive details; peculiarities of construction; water-tight sub-divisions; double bottom; bulk heads, etc.; draught; dates of repairs; condition of ship, etc.

Armour—(a) Vertical---

Belt—material, width, thickness, position, height above and below L.W.L. backing.

Battery—ditto, except height.

Barbette—ditto, ammunition tubes, shields.

Conning Tower—ditto, communication, directors, electric firing, etc.

(b) Horizontal—armoured or protective decks, material height with reference to W.L. hatchway, coffer-dams, etc.

Armament (a) Guns—number, calibre, weight, model, where placed, loading and working of lateral range.

Magazines—number and nature of projectiles carried.

(b) Torpedoes—type, position of discharges, where stowed, etc.

(c) Mines—type, and where stowed.

Torpedo defence and electric lights—description of nets.

Boats—number, how carried and armed.

Engines (a) Main—detail of, revolutions at full speed, horsepower, speed trials, protection.

(b) Auxiliary—number and use, where placed.

Boilers—power number, where placed, drainage.

Coal—amount and how stowed, expenditure and endurance.

Coal is now stowed so as to afford protection to ships' vitals, and in such cases is known as 'coal armour.'

Propellers—number and details, diameter, pitch, etc.

Steering—nature of engines and rudders, protection, turning power, etc.

I am glad to say that we have in every Royal Artillery Head-Quarter office in the world such a description as I have read out of every ship of every nation, supplemented by drawings and photographs, as well.

Of course it would not be possible or desirable that any one should carry such a mass of details in his head regarding ships; but when there is an appearance of hostilities with any nation, attention would be turned towards the ships of that nation and especially to those known to be in neighbouring waters, and officers would set to work to master the chief points, such as their general appearance, speed, draught, length, breadth, armour, and armament so that the all important questions might be considered of, 1st. What is the nature of the target offered? 2nd, How far is it vulnerable to the fire of our forts? 3rd, What is the most advantageous portion of the ship to attack? The draft is of great consequence as it limits the positions in the water area which the ships can occupy, and so are the length and breadth as they define the size of the target.

#### ATTACK BY SEA.

##### ORGANIZATION OF DEFENCE.

We will now leave the ships and step ashore, so to speak, to see what must be done to employ the guns of a coast fortress so as to repel in the best way an attack by sea, and the question immediately arises, "What preliminary arrangements must be made in order that an effective fire may be opened at the right moment and maintained until its object is accomplished?" The answer to this can be given in one word—*Organization*. In order to attain this it is necessary in the first place that every man in the garrison should know his station and duties in action, and that a proper chain of responsibility should be established. In the next place, that the best methods for storing ammunition and supplying it rapidly to the guns, and of replacing, without delay, casualties to men and stores should be devised. Further, that the best means available are made use of for communicating orders, indicating objectives, finding and communicating ranges and deflection, and observing the results of fire, and that they are thoroughly understood by all concerned. Lastly, that the possible modes of attack by an enemy's fleet should be thought out beforehand and schemes of defence drawn out so that no waste of time and ammunition through firing at improper objects may take place. In the first place then, the fortress must be split up into tactical units, each under a commander who will have a definite task to perform, and next an economical but efficient scheme for manning the various guns and works of each unit must be drawn up.

The largest tactical unit is a section, the smallest a group. Under the group officers are the gun captains (sergeants) in charge of the detachment and stores of a single gun, for which they are responsible to the Group Officer. The single gun is the unit of organization, though the group is the smallest *tactical* unit. In some cases a single gun constitutes a group by itself, when the gun captain may be called upon to perform the duties of group officer as well as his own.

#### AMMUNITION.

His duties are to command the details of the men required for the supply of ammunition to the gun floors from the main cartridge and shell stores, to superintend the whole of the operations on the magazine floor, to see that every man knows his post and duty, the magazine regulations strictly obeyed, and keep an account of ammunition expended. To see that no delay occurs in supplying the gun stores, and give timely notice to the Fire Commander when the expense stores are becoming exhausted.

#### COMMUNICATING ORDERS.

Orders are communicated by word of mouth, by orderlies, speaking tubes, telephones, flag signals or bugle calls; but whatever means are adopted they should be clearly understood by all concerned, and should be so arranged that they cannot be taken one for another. The most important orders to be issued are with regard to the ammunition to be used,