

such expenditure as that of the navy with little practical reference to its requirements. It might be unpopular in these piping times of peace to advocate expenditure on the navy, but the very people who in such times denounced our shipbuilding expenditure would be among the very first to turn craven in time of war in presence of the consequences of their own folly. Referring to Mr. Ward Hunt's promises as to the navy, he (Mr. Reed) feared the result of a year's administration on the part of the new Board of Admiralty would scarcely prove satisfactory; for, so far as he could learn, there was little prospect of the twenty-seven ironclads being found in a state of efficiency when Parliament met, and in one respect he anticipated a most serious failure, no very valuable result, as far as he could learn, having been arrived at concerning the boilers of ironclads by the committee appointed to consider that question. He should require to be more fully informed in the next session of Parliament respecting the shipbuilding proposals of the Government than the House was during last session. On the manning of the navy, Mr. Reed said that now, when the mere management of sails was becoming of altogether secondary importance in comparison with the working of machinery for propelling, for working guns, and for other purposes of shipboard, the case was such as to make it absolutely necessary that our officers of every class should receive a scientific and mechanical education, and this could not possibly be obtained unless a thorough grounding was first laid at suitable schools before the seafaring element was introduced. There was so much distraction and excitement on board ships that they were probably the very worst places for studying in the world. He must next say that there was a great field for the Government to develop in bringing about a better relationship and closer identification between our great mercantile marine and the Royal Navy. The efforts made in connection with the Royal Naval Reserve and with the Naval Artillery Corps, fell far short of the requirements of the country. In point of fact, the time had arrived when a thoroughly enlightened and vigorous Minister of Marine might turn his attention with the utmost advantage to the question of relieving the expenses of the Royal Navy, and at the same time of augmenting its practical and potential force in time of war. Mr. Reed, on sitting down, was loudly cheered.—*Broad Arrow*, Dec. 12.

Gunpowder Experiments.

Captain Noble, and Mr. Abel (says the engineering journal *Iron*) have come to a definite stage with their experimental researches into the action of fired gunpowder, and have embodied their conclusions in a report of the proceedings of the Royal Society.

Their objects they state to have been:—(1) To ascertain the products of explosion when fired in guns and mines; (2) to investigate the tension; (3) the effect of various sizes of grain; (4) the variation caused by various conditions of pressure, comparing explosion in a closed vessel with that in the bore of a gun; (5) the volume of permanent gas; (6) the heat; (7) to ascertain the work performed on a shot in the bore of a gun. For this very careful experiments were carried out to ascertain the pressure, volume of permanent gas, heat, and analysis of gases and solid products. A vessel of mild steel, tempered in oil, was used, com-

pletely closed with a closely-fitting screw firing plug, through which were led circuit wires with fine platinum wire enclosed with mealed powder, which it fired when heated by the current of a Daniell battery,

The results were briefly as follows:—The pressure was registered by Captain Noble's crusher gauges at from 1 ton to 36 tons per square inch. The analysis of the gaseous products showed a regular change, due to variation in pressure, carbonic anhydride increasing, with a decrease in carbonic oxide, as the pressure increased. The solid products were subject to greater and less regular variation; speaking generally, the chemical action is more complicated than has been supposed, and the old fundamental equations are found to represent it very imperfectly. More carbonic oxide and potassium carbonate, and less potassium sulphate than has been thought is produced. Potassium sulphide is thought to be formed primarily, but eventually it is not present in any considerable quantity, having given place to potassium hyposulphite. The temperature of explosion is found by means of platinum wire or foil to be about 2200 deg. Cent. About 35 per cent, of the heat generated is communicated to a small arm, and but 3 per cent. to an 18-ton gun. The products of explosion consist of about fifty seven parts weight of solid to forty-three of permanent gas. When the powder fills the space in which it is fired the pressure is about 6400 atmospheres, or 42 tons per square inch. The products of explosion generally are the same in a gun and in a completely closed vessel. The work on the projectile is due to the elastic pressure of the permanent gases. These results have only been obtained by a long and laborious course of very carefully conducted experiments. They are very valuable, and such as but very few individuals have the means of carrying out.—*Broad Arrow*.

The calibre of the English 48-ton gun has been fixed a 12 1-2 in., which, until the completion the 8-1 ton gun, may safely be pronounced the most powerful piece of ordnance in existence. This arm is similar in construction to the 35 ton gun, but is 3 ft. longer, and the projectile is 800 lb. instead of 700 lb. Experiments are being carried out by the Committee on Explosives, in order to determine the kind of powder best suited to these large calibres, the guns having somewhat outgrown the food originally provided for them in the form of pebble powder. The experimental powders under consideration differ materially in appearance from ordinary gunpowder. The "grains" are mostly in the shape of cubes, and various sizes have been tried, some measuring as much as 2 in. along the edge. It is expected that about 130 lb of powder will be the charge for the 38 ton gun.

THE SUPPLY AND DEMAND FOR LUMBER.—The *Portland Presse* says that within ten years not less than 12,000,000 acres of forest have been cut down or burned over in this country. Much of this timber is used for fuel, twenty-five cities being on record as consuming from 5,000 to 10,000 acres each. Fences use up much timber, and railroad ties require the product of 150,000 acres a year. The amount of pine and hemlock timber yet standing in the forests of the timber states is estimated at 225,000,000,000 feet. The sum of \$44,000,000 is invested in this industry, affording employment to 200,000 men.

Yesterday Her Majesty the Queen received M. d'Agiout and the Comte Serrurier, who arrived a Windsor Castle to present a remarkable testimonial of thanks from the French nation. This "Homage National" consists of four magnificent volumes of addresses sent to England by the various French departments and municipalities, in testimony of their gratitude for the assistance which England gave to France in 1870 and 1871. The deputation, representing a committee, was introduced to the Queen's presence in the Audience Chamber by the Earl of Derby, and was presented to Her Majesty by the French Ambassador. The Queen, accompanied by Princess Beatrice, and attended by the ladies and gentlemen in waiting, afterwards received the deputation in the White Drawing Room. Her Majesty received the offering most graciously, and as the volumes were of considerable size, they were placed on a table for the purpose of being shown to Her Majesty, and M. d'Agiout and Comte Serrurier explained the name of their contents. Having accepted the volumes, Her Majesty, made a reply to the deputation in French, of which the following is a translation:

I accept with pleasure the volumes which you have presented, and which will be carefully preserved by me as records of the interesting historical events which they commemorate. They are beautiful as works of art; but their chief value in my eyes is that they form a permanent memorial of the gratitude of the French people for services freely and spontaneously rendered to them by Englishmen acting under a simple impulse of humanity. Your recognition of those services cannot fail to be appreciated by my subjects, and it will increase the friendly and cordial feeling which I am happy to believe exists between the two nations.

It may be of interest to state that twenty-six general councils, in the name of their departments, express the national gratitude to England. More than 900 municipalities, under different forms of expression, but all inspired by the same feeling, come forward to proclaim the deep feeling of the inhabitants. At Boulogne-sur-Mer the whole town signed the address. From Bourges it is said that in the midst of the misfortunes of France the English people assisted by charity the solidarity of peoples. Calais, Lorient, Angers, and Nantey coincide with this utterance. From Etrepagny (in the Eure) comes the following:—"The great English nation, hearkening but to the voice of her heart, came to bring help to our wounded soldiers, and generously brought to us her harvest. Honour to the English people! May God bless and protect them!"—*Broad Arrow*, 12th Dec.

THE STEAMSHIP AFLOAT.—It is stated on British authority, that there were 4,335 steamships afloat in 1872, of which 2,538 were from Great Britain, and averaged 800 tons each. The year following 460 steamers were built in Great Britain, averaging 1,167 tons each. It is estimated that there are 5,250 steamers afloat this year. The figures do not include river craft.

King Alfonso has sent a telegraphic despatch to Canovas confirming the ministerial appointments, and expressing a hope there will now be inaugurated an era of real liberty, peace and forgetfulness of past discords.

The Police at Arizona have arrested a number of women belonging to a nunnery, convents being prohibited by the new law.