NAVAL ARCHITECTURE OF GREAT BRITAIN.

IRON SHIPS.

An "Institution of Naval Architects" having been formed in London recently, a congress, composed of the most eminent shipbuilders and naval architects of Great Britain, was held during the early part of last month. Its deliberations were presided over by Sir J. Pakingham, G.C.B., who deemed it one of the highest honors to occupy that position. Quite a number of papers were read on different subjects relating to shipbuilding; but the most important seemed to be that of Mr. Wm. Fairbairn, C.E., on the construction of iron ships. He stated that he had been engaged for a period of 40 years in various works connected with iron, and its application for shipbuilding purposes. About 30 years ago, in conjunction with the the Messrs. Laird, of Birkenhead, he found by numerous experiments that vessels made of iron would be capable of more resistance, lighter, and better calculated for a large cargo than timber-built vessels. Messrs. Laird and himself then commenced building iron vessels on a large scale, and from 1835 until 1848 upwards of 100 first-class ships were produced. When first constructed, iron vessels had many defects; great improvements had since taken place, but much remained to be done. Of late years this class of vessels had been constructed very long, in order to give them fine lines and increase their carrying power; but hitherto this increase of length had been obtained at an expense of the strength of the ship. In many cases the length of iron vessels was eight or nine times that of the beam, and although he did not say that such had yet obtained their maximum length, yet the mode of construction was capable of much improvement. He assured them that vessels in a rolling sea, or stranded on a lea-shore, were governed by the same laws of transverse strain as hollow iron beams, like the Britannia tubular bridge; hence a ship could not be lengthened with impunity without adding to its depth or the sectional area of the plates in the middle. An iron ship of the ordinary construction—300 feet long, 41½ feet beam and 26½ feet deep—was inadequately designed to resist strains when treated as a simple beam; and a ship was like a simple beam when supported at each end by waves, or when rising on the crest of a wave, it was supported on the center with the stem and stern partially suspended. In these positions an iron ship underwent, alternately, a strain of compression and a strain of tension along the whole section of the deck, corresponding with equal strains along the keel. Such a vessel could make a number of vogages on sea, because it was there sustained in a measure by the water; but when driven upon a rock, with its bow and stern suspended, it would break in two, owing to the insufficient mode of constructing the decks. An iron ship of the foregoing dimensions, as usually constructed and tried by the beam formulæ $W = (a\ d\ c + l)$, would be broken asunder if tried with a weight of 960 tuns suspended from bow and stern. But if the deck beams were covered with iron plates throughout the whole length on each side of the hatchway, so as to render the deck area equal to that of the bottom, we should have nearly twice the strength. He next considered the displacement of such a vessel in tuns, and found the strength far from satisfactory. When loaded to a depth of 18 feet, the displacement was about 177,000 cubic feet—equivalent to 5,000 tuns for the ship and cargo. If we considered this weight uniformly distributed, and compared it with the strength determined, we have a load uniformly distributed of 5,000 tuns to that of the breaking weight of the metal in the vessel, which would leave a deficiency of strength equal to 1,160 tuns; so that, if laid high and dry on a rock at the center, it would break with four-fifths of the load which it carried. These were extreme cases, but ships should be built for them if possible. There had been improvements introduced recently in iron vessels, still they were all too weak in the decks. These, he argued, should be so strengthened as to be equal to the keel, and thus provide a margin of strength for every contingency. He recommended the addition of two longitudinal stringers, running one on each side of the keel; the covering of the cross-bearers of the upper deck with iron stringer plates thickest towards the middle; also two cellular rectangular stringers—one on each side of the hatchways—all running the whole length of the ship. He also argued the importance of using the best quality of metal. No plates should be employed that were incapable of withstanding a tensile strain of 20 tuns per square inch. This paper elicited an animated and lengthy discussion.

Mr. J. Scott Russell pointed out various improvements which he had carried out, especially with relation to water-tight bulkheads. These were a source of great strength to iron vessels, as they were placed inside the ship, and even if a collision took place, and the ship was cut through, they would save it from sinking. Twelve years ago he built a vessel which might be described as all bulkheads, and entirely divested of frames. Believing that the center of the vessel required to be essentially strong, he carried a web of iron completely through it, in some cases passing through the bulwarks, and sometimes avoiding them.

Mr. Ritchie (Surveyor of Lloyd's Register) said he should like to hear something from Mr. Russell on the subject of rivets.

Mr. Russell said that was a most important matter in the construction of iron ships. He had recently inspected a vessel returned from a voyage, and found that the heads of at least 1,000 rivets were off. How they came off was a mystery to him; but he gave a very modest rap with a hammer and one of the rivets dropped out. He had adopted the system of conical riveting, which he found to answer very well, as when the head was gone the rivet was perfectly water-tight.

Mr. Napier (of Glasgow) observed that he did not approve of the tubular system advocated by Mr. Fairbairn; and it must be remembered that a stationary tubular iron bridge had not to contend with the constant strain of the sea. Many and conflicting opinions prevailed as to the best form of the keel; some were for baving it flat, others sharp; and perhaps both were right. (Laughter). For his own part he did not build a vessel to go on the rocks, but if she were taken there he could not help it. If they could possibly arrive at the absolute breaking power of the sea which an iron vessel would bear, it would be a great discovery. He agreed with Mr. Scott Russell that it was not in the power of man to build a ship which would be able to bear up against the breaking power which the *Royal Charter* encountered as the sea went over her broadside.

Mr. Fairbairn again addressed the meeting, expressing his opinion that iron shipbuilding was at present in a transition state. They required to have better and stronger plates; and if owners would only give a fair price for their vessels, many catastrophes which resulted from the use of bad iron might be averted.

In our next we shall present the substance of some of the other interesting papers read at the above-named congress.

AMERICAN MANGANESE.

Messrs. Editors:—I wish to say a few words to the readers of the Scientific American on the subject of manganese. I am aware that it is a mineral of great value to the arts and sciences, but that its use is much limited by its high price and the small quantity in our market. I understand it has been, and perhaps is even now, imported to this country from Germany at high figures. My aim is to impart information as well as to gain it. I wish to tell our chemists and scientific men that Virginia can furnish all the manganese that their wants may require; and a pure, excellent article, at comparatively low prices. It abounds in different parts of the State, and has been developed in large quantities on our great leading lines of railroad and canal. It can be mined and delivered in any of our Atlantic cities much lower than its present market value, and still leave handsome profits to the miner. Some of our manganese has been shipped to Germany—principally the black oxyd, containing from 60 to 80 per cent of manganese. We have both gray and black, but the latter is the most abundant. If any of your readers would like more information on the subject, I shall be ready at any time to impart it, as far as the mineral is concerned—its character, locality, extent, formation, &c., &c. But I wish to know from yourself, or from some of your readers, into *how many uses* this mineral (in its various forms) now enters, *how much* of it is used altogether, *whence* it is obtained in this country, and *at what prices.* Many of your readers are interested in this matter, and would be glad to hear what you have to say on the subject, particularly those of your subscribers who live in Virginia, many of whom possess this mineral without knowing its full value.

I wish, also, to call attention to the general mineral productions of this State, which have been long neglected both at home and abroad. Very few know anything of the vast extent of our coal-fields, or our immense and varied deposits of iron ores, which are not excelled by any other State or any other country of like extent in the world, and which, when properly developed, must become a magnificent source of wealth to the "Old Dominion," independent of our ores of copper, lead, manganese, &c., which also promise an abundant yield. The first great effort towards the development of our iron ores, for practical purposes, has just been inaugurated in the establishment of a magnificent furnace near this city, which furnace—for simplicity, elegance and substantiality of structure, and general arrangement of improvements—will compare favorably with any work of the kind in this or any other country.

S. Herries DeBow.

Richmond, Va., May 15, 1860.

[We have made inquiries, but have not been able to ascertain the amount of manganese imported annually; but we know it must be small, because it is only used in the manufacture of chlorine gas for bleaching purposes, and this is not carried on to a very great extent. It is also very moderately used as an oxydizer to render paints quick-drying. We are aware that Virginia possesses vast natural resourses of the most valuable minerals—gold, copper, iron, lime and coal.• All that she needs in order to become, perhaps, the very greatest manufacturing and wealthiest State in the Union, is a great increase of skillful and industrious operatives and manufacturers.—Eds.

INVENTIONS FOR WOMEN—SENSIBLE SUGGESTIONS.

Messrs. Editors:—I was much gratified by reading the two letters of your fair California correspondent—Mrs. M. L. Varney—(published on page 410 of the first volume of the new series of the Scientific American, and page 279 of the present one), expressing her views on the subject of lightening the household labors of women. I can endorse all she said about the *cooking stove;* but I would remark, in addition, that, in a coal-burning district and in the winter season, a good method whereby the clinkers and non-combustible refuse could be easily removed from the bottom of the stove, without disturbing the fire at the top (and thus gain the ability to keep up a good fire for months, if required), would add still more to the value of that "woman's friend." I prepared a rough sketch of a plan to secure this result, and offered it, gratis, to an eminent stove-manufacturing firm, considering myself well paid if I should be the means of lessening even only one poor, overburdened woman's ceaseless labors. They spoke favorably of my idea, liked my method, and concluded by politely declining to have anything to say to it; thus speaking volumes for the value of my invention!

A *washing machine* is still a *desideratum*—I mean a small one, adapted to an ordinary family. There are large ones, driven by power, that operate satisfactorily; but I have never seen a really good small one among the multitudes daily offered for sale. A radical fault with most of them is, that the washerwoman's arms still furnish the driving power, so that the muscular labor is little (if anything) reduced, and is often much increased by friction. They ought to be so arranged that other power may be available—be it horse, water, steam or (what is more readily obtained) the husband's arms; he, surely, could afford to *spell* for his "better-half," occasionally, at such a laborious, unhealthy business. Then the water always ought to be kept boiling in the clothes receptacle, as the hands should never go in there; here Mrs. Varney's idea of a "wringer" would come into play with good effect. It seems to me that the caloric engine promises much for housewives; it might do well for working the aforesaid washing machine, grinding coffee, chopping meat, and a hundred other jobs that would hardly call for a steam engine. Could not the heat of the caloric engine be also made available for all the purposes of cooking, warming water, &c.? There is a fine opening in this direction for inventors. I, myself, have also "thought out" a washing machine, but, from the "brilliant success" of my cooking stove, I fancy the washer will remain in the workshop it was made in—the brain.

What is the use of invoking the inventive genius of the age to devise a good working-dress for females, when they will not wear a most excellent one that is already