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 do with 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 not only invented, but, still better, well-tested by ample experience. I mean, of course, the "reform dress," or "Bloomer," as it is generally mis-named. Perfection is not claimed for it, although, compared with the body-crushing costume now in fashion, it almost does seem like perfection. It is not necessary for inventors and artists to exercise their powers on a new dress for working females; but it *is* necessary for the millions of working females to take courage enough to adopt a dress that is already waiting for them, and for the millions of short-sighted men to sustain them in this course. So besotted is the prevailing taste for "Paris fashions" that, if the wisdom of a Newton and the ideality of a Raphael were strained to the utmost to devise a good and beautiful apparel for women, it would be rejected for the last whim of the Empress Eugenie! This matter is particularly appropriate for the columns of the SCIENTIFIC AMERICAN, which is pre-eminently the industrial paper of the country; and what more nearly concerns the industry of about one-half its inhabitants than the question of a good *working-dress for women?* E. M. RICHARDS.

Moore's Ordinary, Va., May 14, 1860.

IMPROVING FARMS WITHOUT MANURE.

We request the attention of our farmers and all others interested in agriculture to the following letter:—

MESSRS. EDITORS:—Although our opinions are so widely different on the principle which governs the vegetable kingdom, yet there is one point on which we perfectly agree, namely, the subject is one of great importance to our people. But when you say that every bushel of wheat or other crop taken from the soil is required to be returned again, in constituents, in some form or other, under penalty of barrenness, our opinions again widely differ. You say that this fact is now universally recognized. This is proof to me that your knowledge of the views of those who cultivate the soil is very limited indeed. A very large majority of the farmers with whom I converse, express reverse opinions. They assert that if the constituents which are taken off the soil had to be returned, they would give up farming in despair, because it would be impossible for them to do so. I read your article on agricultural science to my next neighbor, and asked him how much he returned to the soil annually. He replied, that for thirty years he had taken a large amount of hay, straw, grain and roots, and sold them in the market, for which not a particle had been returned to the soil, and yet his farm had greatly improved during that time. Nine out of ten of the farmers with whom I have conversed and to whom I have put this same question, have testified in the same manner. G. B.

Bethelhem, N. Y., April 28th, 1850.

The constituents of the soil for raising crops mean those manures called "fertilizers." If our correspondent and his neighbors have cultivated their farms for a number of years without manuring them, and have taken several crops from them during those periods, and at the same time have greatly improved their land, then they have discovered the "philosopher's stone," and we recommend their appointment as professors in all our agricultural colleges and schools. We assert without fear of successful contradiction, that every crop taken from the soil requires to be restored again in constituents in some form, under the penalty of future barrenness. We know that on the rich river-bottoms of the West the soil is very deep, and it will take many years to exhaust it, but thousands of farms have become barren in this new country on account of not restoring the constituents of crops regularly to the soil. We know something about farming practically, but have not learned in the same school as our correspondent and his neighbors. If he is right, what a lot of fools must those farmers be who spend money for guano, superphosphates poudrettes and other fertilizers. If one man can improve his farm and take crops from it regularly for thirty years without manuring, so can all farmers—if they know how. We trust our correspondent will communicate the method by which this is done, as it is of great consequence to the whole world.—EDS.

MORIN ON "FRICTION."

The very important subject of friction has been more thoroughly investigated probably by Arthur Morin than it ever was by any one else. His experiments were made at Metz in 1831, '32, '33 and '34, and were published in *Récueil des Savans E'trangers*, tomes IV. and V. The general results are stated in his work on "Mechanics," recently translated by Joseph Bennett, and published by D. Appleton & Co., of this city. As some of our readers may not have met with an account of these most valuable experiments, we present a very brief abstract of the most interesting results.

The three principal laws which Morin established in regard to the friction of plane surfaces rubbing on each other are these:—1st, The friction is proportional to the pressure; 2d, It is independent of the area of the surfaces of contact; 3d, It is independent of the velocity of motion.

A weight was placed upon a plane and drawn along by a cord passing over a pulley with a weight suspended at its end. The power required to bend the cord, the friction of the pulley, and all other modifying elements were measured and taken out of the problem; so that the figures show the number of pounds required to overcome simply the friction of one surface rubbing on another under different degrees of pressure, with different materials, and with several lubricating circumstances. For example, cast iron resting upon cast iron, without any lubricator, and pressed down with a weight of 496.1 lbs.; it required 64½ lbs. hanging perpendicularly to overcome the friction in drawing the upper piece of iron along; and the ration of 64½ to 496.1 is 13-100, or expressed decimally, it is in proportion of 0.13 to 1. In other words, it requires 13-100 of a pound suspended vertically to overcome the friction of one pound of dry cast iron resting upon a plane cast iron bed.

Cast Iron upon Cast Iron.

Area of sur- in contact in sq. feet.	Lubricator.	Pressure. lbs.	Friction. lbs.	Ratio of friction to pressure.
0.3874	Nothing	496.1	64.5	0.130
"	"	1091.1	211.1	0.193
"	"	4412.7	681.7	0.154
			Mean	0.154
0.3874	Water	1104.3	312.3	0.282
	"	2202.7	731.3	0.332
			Mean	0.311
0.3874	Lard	1103.4	72.9	0.070
Strong Leather—tanned and placed flatwise upon Cast Iron.				
0.4155	Nothing	471.0	272.7	0.579
"	Oil	1114.1	140.9	0.126
Brass upon Oak—without unguent; the fibers of the wood being parallel to the direction of motion.				
0.141	Nothing	248.3	153.6	0.616
Oak upon Oak—the fibers of the wood being parallel to the direction of motion.				
2.798	Nothing	2291.5	1080.6	0.471
1.062	"	102.1	50.8	0.498
0.33	"	604.0	293.5	0.484
Elm upon Oak—the fibers of the wood being parallel to the direction of motion.				
1.338	Nothing	260.0	117.2	0,45
"	"	1980.1	821.7	0.42

From the above table it will be seen that, when cast iron is rubbing upon cast iron with the bearings dry, the friction is doubled by wetting the bearings with water, while it is reduced more than half by lubricating with lard. The friction of brass rubbing upon oak is about nine times that of lubricated cast iron upon cast iron, being considerably more than the friction of oak upon oak.

The following table exhibits the ratio of the friction to the pressure for various substances rubbing together with the same lubricating material. In these experiments, the substances, after having been smeared with an unguent, were wiped, so that no interposing layer of the unguent prevented their intimate contact. In all cases in which woods were tried, the fibers were parallel to the direction of motion:—

Copper upon oak	0.100	Elm upon elm	0.140
Brass upon cast iron	0.107	Cast iron upon wrought	0.143
Cast iron upon oak	0.107	Cast iron upon cast iron	0.144
Oak upon oak	0.108	Wrought iron upon brass	0.160
Yellow copper upon cast iron	0.115	Wrought iron upon wrought	0.177
Elm upon oak	0.119	Leather upon brass, wetted	0.244
Brass upon brass	0.134	Leather upon cast iron, wetted	0.229
Elm upon cast iron	0.135	Beech upon oak	0.330
Wrought iron upon elm	0.138		

Morin says that the three laws of friction above stated were proved by all the experiments in the whole 179 series which he tried, *without one exception*. In making up the first table we have selected instances of as widely varying pressure as possible, in order to show our readers just how much range there is in the ratio of the friction to the pressure.

We shall publish next week the most important results obtained by Morin in his experiments on the friction of *journals*, with his general conclusions and practical hints. These will be found very valuable to such of our readers as have not chanced to meet with them.

PRODUCTION OF A COPPER GREEN WITHOUT ARSENIC.

BY PROFESSOR H. DUSSANCE.

The green of Scheele and Schwanfurtz (arsenite and arseniate of copper) are much used in the manufacture of paper-hangings, buildings, paintings and many other arts. Their preparation is a dangerous one; and, lately, a great many poisoning cases have occurred from their use in covering the walls of apartments. I think it will be a great benefit to make known some colors having the same optical qualities as the foregoing, without their chemical dangers. I have found a method of making a green equal to the one of arsenic, and not so dangerous; and I believe it will be used. There are several ways of preparing it. I will describe the two that are quickest and cheapest:—

First, Take 19 lbs. of quick lime, slack and mix it with water to make a milk of lime; add to to it a solution made with 100 lbs. chloride of copper; then boil the mixture for some time, and filter through canvas. The portion which remains in the filter (the precipitate) is the coloring matter. Wash it with hot water, and dry it at about 90° Fah. The filtrate is a mixture of chloride of copper mixed with a chloride of calcium. To prepare the chloride of copper, dissolve, separately, in hot water 62 lbs. fused chloride of calcium and 100 lbs. sulphate of copper; mix the two solutions, and shake well. It forms chloride of copper, soluble, and sulphate of lime, insoluble. Filter this through a canvas; the sulphate of lime remains on the filter, and the chloride of copper passes on the filtrate. The precipipate is washed with hot water. The above quantities gives 75 lbs. anhydrous chloride of copper.

Second, The same color could be obtained in boiling for about one hour 47 lbs. of whiting (carbonate of lime) with 100 lbs. sulphate of copper, filtering and washing the precipitate (which is the color) with boiling water, and drying it at about 90° Fah. In substituting the carbonate of magnesia for carbonate of lime, the same product is obtained.

Colors prepared by these processes are solid, durable, and acquire brightness with artificial light, while they do not present the dangerous properties of the arsenical preparations.

I must describe another industrial application of these important re-actions, which could be applied with advantage. If we heat the carbonate of magnesia with sulphate of copper, as above, we obtain three products: first, the green chloride; second, carbonic acid gas, which could be used in the preparation of aerated waters; third, sulphate of magnesia, so important in medicine. If the manufacturer has only for his object the preparation of carbonic acid and sulphate of magnesia, he may substitute sulphate of alumina for sulphate of copper.

These chemical re-actions are important enough to call the attention of manufacturers; and it will be a great benefit for many trades to substitute these preparations for the dangerous colors prepared with arsenic.

LAKE SUPERIOR COPPER.

The Lake Superior *Miner* states that a discrepancy lately found its way into our columns, regarding the amount of copper obtained from the mines of that region during the past year. "Instead of being 696 tuns, as stated, it was about 6,096 tuns, as follows:—

Ontonagon district	2,610	tuns.
Portage lake "	1,573	"
Eagle river "	1,301	"
Eagle harbor "	607	"
Copper harbor "	3	"

These sums, adding the fractions omitted in the above, give the total shipments last year, 6,095 tuns 1,621 lbs. Perhaps the error in the quotation we make may have occurred by setting down the total product of our mines last year, 6,096 tuns, and the typo left out the cipher, which the proof-reader failed to correct."

If our cotemporary had constantly conned the carefully-revised columns of the SCIENTIFIC AMERICAN, he would have seen that we published the substance of the above "correction" on page 187 of the present volume —*ten* weeks ago!

We learn from the *Miner* that the copper-mining business is active and apparently prosperous. It says:—"We are not at present working, probably, on any 400-tun mass, as we were two years since, but there is more mass copper showing in several of our best mines than at any previous period in the history of the country. Three mines in Rockland township, twelve miles from this village, are yielding in the aggregate about 270 tuns of copper per month."