IRON-CLADS AT HOME AND ABROAD.

The appended article recently appeared in the N. Y. *Daily Times*; our readers will find it worthy of their attention:—

"We have previously mentioned the increase of the navy at the close of the year 1861, but we omitted to observe that it was as early as in the beginning of August of that year that Congress provided by a special act for the construction of iron or steel-clad steamships or steam-batteries, directing the Secretary of the Navy to appoint a board of naval officers to investigate the plans and specifications submitted for these objects. The board approached the performance of their duty with hesitation and diffidence, for in this country there was no experience, and but scanty knowledge in this branch of naval architecture. The plans handed in were so various, and in many respects so entirely dissimilar, that the board may justly congratulate itself upon the success attending its first selections.

"At the time of which we are speaking the French and English plated vessels carried only broadside guns, and were protected by armor-plating of four and a half inches, placed against a more or less thick backing of wood—the hull being in some cases of wood, and in others of iron. Of the three vessels selected by the board, two were to be built of wood and iron, on the European plan. One of these two proved to be a failure, but the other, known as the *New Ironsides*, is as efficient a vessel for her size as any seagoing iron-clad afloat. Besides following the example set us abroad, the United States originated an entirely new pattern of iron-clad vessels, called from the first one of them the 'Monitor' class, which have proved practically invulnerable, and have performed, and promise to continue to perform, the most valuable service. At the close of the year 1862, the Navy Department was in possession of fifty-two iron-clad vessels (including those in the Western waters), 28 of which were on the sea-board. At this period the whole number of vessels of the navy amounted to 427 of all descriptions, which was an increase of 221 over the number given for the previous year. If we carry these estimates still further forward, we shall find that the number of vessels at the close of the year 1863 was 558, showing a still further increase of 161. Of these 46 are iron-clad steamers intended for coast service, some of them being still under construction.

"In the event of foreign aggression, these iron-clad vessels constitute the force upon which we are to depend in a considerable measure, for the protection of our coast. Those of them belonging to the monitor class have been subjected to actual trial in war, and have proved to possess a power of endurance never before imagined. We may look forward with confidence to the result of a conflict between these vessels and vessels like the *Achilles* or *Magenta*. Upon this subject the recent engagement between the monitor *Weehawken* and the rebel armored steamer *Atlanta* affords very satisfactory evidence. The *Atlanta* resembles the French and English plated vessels in her style of construction and armament, though much less strong; but the extreme facility with which she was placed *hors du combat* justifies the expectation that neither the *Warrior* nor even the monster *Bellerophon* would prove an overmatch for the largest monitors. The truth is, that a single shot, and that the first one, decided the fate of the *Atlanta*; forty officers and men were wounded or stunned by its effect, and if no other shot had been fired that day, the victory would have been as complete as it was acknowledged to be when the remaining four shots had been delivered. If the first attack of the monitors upon Charleston was a sufficient proof of the enduring qualities of these vessels, the easy conquest of the *Atlanta* was an equally satisfactory evidence in favor of our new ordnance. The careful observer will be struck with this as a much more important general result than any that followed from the famous engagement between the *Monitor* and the *Merrimac*. The latter was repulsed with signal success, but we never had the means of learning the injury she sustained; we know, however, that the former came out of the action in the same condition that she went into it. The English have discovered that four and a half inches is not a sufficient thickness of plating, and they have resorted, in the case of the *Minotaur*, to five and a half inches, and in the case of the *Bellerophon* to six inches. The last two ships are as we understand, the only ones hitherto built that are wholly protected above and to some distance below the water line. They are undoubtedly gigantic men-of-war, fitted to control the seas over which they range. We are far from wishing to disparage their power and their value. On the contrary, we would cite them as examples for imitation; and urge upon Congress the imperative necessity of building similar vessels ourselves, without which we shall not be in a suitable condition to drive a blockading force from our ports, though we may prevent that force from entering them. There is no doubt that the pleasure of entering the harbor of New York or Boston in these heavy iron-clad vessels, running by the forts with safety, and laying the cities under contribution, is a scheme of aggrandizement which, though much more difficult to execute, has as often been contemplated as the act of sweeping the commerce of the United States from the ocean by piratical cruisers. It is some satisfaction to believe that we shall prove to be, with a little warning, sufficiently on our guard, and well enough armed to prevent this outrage. But this is not enough. We must be prepared to meet our foes on the threshold, and beat them backward home.

"We ought to be prepared to make such an undertaking so hazardous that it will not be hastily attempted; and there is no doubt that this is in our power. Recent experiments have afforded the most conclusive proof that not even the *Bellerophon*, with all her magnificent proportions, could stand before our heavy ordnance. To this ordnance we have owed a great deal, and our past successes enable us to look forward with hope for the future. The change which has taken place in our navy ordnance has been commensurate with the changes in the vessels. At the commencement of 1861, the eight, nine, ten and eleven inch guns were the largest in the navy; and of these, it appears from the last report of the chief of the Bureau of Ordnance, there were 958 in the possession of the Government before the breaking out of the war. But a considerable number of nine and eleven-inch guns fell into the hands of the insurgents at Norfolk and Pensacola, and had to be immediately replaced. To these were added for the first time, the newly invented thirteen-inch mortar, the new Parrott rifled guns, from the 20-pounder to the 150-pounder, the new fifteen-inch smooth-bore gun, and the Dahlgren 20-pounder rifled gun. The whole number of guns, of all calibers, made between March, 1861, and November, 1863, amounts to 2,811, and it is probable that the end of the current year will witness a further addition of 700 guns of the largest size. This change in the armament of the navy, by the addition of rifled guns and guns of the heaviest caliber, is exemplified in the composition of the batteries of the vessels of different rates. Besides the Dahlgren nine and eleven-inch guns, the battery contains one 150-pounder and four 100-pounders rifled. The weight of metal must vary, independently of the rating, according to the size of the vessel. But vessels of the lowest rate carry rifled guns, while vessels of the monitor class carry one fifteen-inch gun.

"For the manufacture of all these heavy cannon the Department was obliged, at first, to depend on the well known foundries at South Boston, Fort Pitt, and West Point. Several other establishments have since added their co-operation, at Portland, Boston, Providence and Reading. This rapid development of the mechanical ingenuity and the resources of the country has already placed us on such a footing as to relieve our minds in a great measure from previous anxieties on this head."

Riveted Joints in Wrought Iron.

One of the most important operations in engineering is the making of joints in wrought iron, or joining two or more pieces of wrought iron together. It is equally important to have a good and proper joint in a wrought iron girder as in a wrought iron steam boiler. Many lives and valuable property may depend upon the quality of the joint in either case.

In a wrought iron girder whose length is too great to have the plates, bars, or angle irons in one piece, extending from end to end, except by welding, which is generally too expensive, and not always safe until each weld has been tested, it is necessary to connect the two or more pieces of metal in such a manner that the whole of any strain on any one plate or bar shall be taken through or conducted to the next plate or bar with as much safety as if the two pieces of metal were one. This conduction of strain from one bar to another ought always to be done with the least possible amount of metal in the joint, for self-evident reasons. Any excess of metal in the joints of course adds to the weight of the girder, and not only adds the excess in the joints, but also increases the sectional area of the girder throughout, so that the girder must be calculated to carry that excess of dead weight, and is therefore much heavier.

The quantity of wrought iron now used in various constructions which are "built up" of separate plates and bars of wrought iron is so great that, with a good and proper arrangement of joints, a large amount of metal would be saved. It can easily be imagined that any excess of metal in the construction of a girder must diminish the span that it would otherwise carry itself over with safety.

In wrought iron construction the joints should be as few as possible. The plates and bars should be made of the greatest possible length, but not to exceed such a size and weight as to increase the cost of rolling them. The joints can be made by placing the various parts so that one piece shall lap over another, and the two be riveted together. In this case the rivets will be in "single shear," that is, in pulling the two pieces of iron apart, each rivet will be sheared or cut through, only once, whilst if the pieces of metal butt against each other and have a joint plate or bar on each side and riveted, the rivets will be in "double shear," that is, each rivet must be sheared or cut through, in two places before the joint will break. Therefore, this kind of joint requires only half the number of rivets that there are in the lap joint. It is this butt joint which is generally made in girder work, for the very evident reason that, although two joint strips or plates are required —one on each side of the abutting plates—only half the number of rivets are necessary to make to make an equally strong joint as the "lap joint." Where several plates or bars have to be joined at the same place, as is sometimes the case in the flanges of girders when composed of several thicknesses, where they all butt in the same plane, the joint plates of necessity extend some distance on either side of the joints, so as to have room for the proper number of rivets. In this case the rivets should be placed as near to each other as possible without injuring the strength of the plates. Otherwise, if they are too far apart, the first row of rivets will have a much greater strain than the second row, the second row a greater strain than the third, and so on to the last row, which will have the least amount of strain. In fact, this will be the case no matter how near each row is to the other, but the difference will not be so great. It is the elasticity of the metal which causes this difference of strain on the rivets. A joint plate might be so long that the first row of rivets would actually be sheared before the last row had any strain upon them worth speaking of. Therefore, for two reasons, the joint plates should be as short as possible—first, to get as nearly as possible an equal strain on all the rivets, and secondly, to have the least amount of weight in them.

The rivets should in all cases be so arranged that the holes, if drilled, would not decrease the strength of the bars, or useful sectional area, more than by one hole. And the sectional area of the shearing parts of the rivets on each side of the joint should never be less than the sectional area, *minus* the rivet holes, of the bar or plate to be joined. It has been proved by experiment that the ultimate resistance to shearing is proportional to the sectional area of the bar torn asunder, and that the ultimate resistance of any bar to a shearing strain is very nearly the same as the ultimate resistance of the same bar to a tensile strain. Therefore, if the sectional area of the shearing parts of the rivets on each side of the joint is equal to the useful sectional area of each bar to be joined, there will be the same strength in the rivets as in the joined plates or bars. In most cases it is advisible to have some excess in the sectional area of the rivets, to allow for bad workmanship. Sometimes the rivet holes in several pieces of metal are not fair with each other, and when the rivet is driven in hot, it accommodates itself to the irregular hole, and forms a bad rivet, having lost a portion of its shearing area. A still greater excess should be allowed in the case of rivets that pass through a greater number of pieces, for the holes are more likely to be irregular. The excess to be allowed depends very much upon the quality of the workmanship in the construction. If the holes are carefully drilled the excess to be allowed may be much less than when the holes are punched.

In addition to the shearing strength of the rivets, some strength may be calculated upon from the friction that is produced by the riveting and cooling of the rivets; this additional strength can only be calculated upon as an addition, when it is quite certain that the rivet holes are completely filled by the rivets.

Experiments show that a three-quarter inch rivet properly riveted in three plates or bars, the center one having a slotted hole, will take five tuns to overcome the friction of the heads of the rivet, and make the center plate slip between the other two, and the friction given by a ⅞-inch rivet will not be overcome with less than seven tuns. This extra force from friction is no addition to the shearing strength of the rivets, unless the rivet holes are well filled up. There is no doubt this friction adds much to the rigidity of built wrought-iron girders, and has something to do with the deflection being no more than it all the joints were welded. Good riveting will bring all the plates into close contact, and besides adding to the stiffness of the work by friction, it prevents anything more than a superficial coating of oxide between the faces riveted together.

No doubt machine riveting is the best for giving the greatest friction, and filling the rivet holes most perfectly; and it certainly injures the rivets less than the succession of blows given by hand riveting. In hand riveting many of the blows are given when the rivet is comparatively cold, and have, therefore, a tendency to destroy the quality of the iron in the head; and, again, hand blows cannot force the metal into the body of the rivet hole in any way to be compared to machine riveting. A machine riveted boiler is generally tighter under pressure than a hand riveted boiler, showing the plates are in closer contact, and better able to resist corrosion by being riveted with machinery.—*Mechanics' Magazine.*

ALEXANDRE VATTEMARE.

At the meeting of the Farmers' Club, held on the 26th of April, the President, N. C. Ely, Esq., made a formal announcement of the death of Alexandre Vattemare, an honorary member of the American Institute, and formerly a frequent attendant of the meetings of the Farmers' Club. The announcement was responded to by—

Dr. David Holton:—Mr. President, I have met with Monsieur Vattemare, as associated in labor with the late Josiah Holbrook. Forty years ago Mr. Holbrook commenced in Boston his labor of organizing a system of exchanging minerals and other specimens of natural history between different schools. The pupils of each district collected specimens prevalent in their district, and the duplicates of these were exchanged for the duplicates of other districts, and thus large cabinets were cheaply and easily formed.

Monsieur Vattemare, at that time a distinguished ventriloquist, happened to meet Mr. Holbrook in this city, and he conceived that the system of exchanges which Mr. Holbrook had successfully established between districts, towns, counties, and States, might be extended to nations, kingdoms, and empires. To this great labor Monsieur Vattemare devoted the remaining years of his life.

On the Fourth of July, 1855, I was in Paris, and witnessed the opening of the hall dedicated to the reception of the books from the United States in the exchanges organized by Monsieur Vattemare. The rooms were quite spacious, and were piled with the best American works, a present from the publishers. The Emperor had directed alcoves to be set apart for them in the Hotel de Ville, where they might be accessible to those desirous of consulting them. A discourse was pronounced by Mr. Guizot, highly complimentary to American literature and to the labors of Monsieur Vattemare.

At that time it was my lot to announce to Monsieur Vattemare the death of Mr. Holbrook, his fellow laborer. Mr. Holbrook was gathering mineralogical specimens with his hammer and basket, near Lynchburgh, in Virginia, when he fell down the mountain, and his body was found in the river at its base.

In making the exchanges organized by Mr. Holbrook, a small cabinet of minerals was forwarded to each member of the New York Legislature; and this was a year or two before the vote inaugurating a geological survey of the State. Perhaps the possession of these curious specimens may have had some influence on that vote, which has resulted in so much honor to this State among the men of science throughout the world.

Mr. Robinson:—It was the propelling power that carried the measure through. There is no doubt of it.

Patent Machinery for Punching Plates.

M. H. Lishman, of Stockton-on-Tees, England, obtained a patent on the 14th of August, 1863, for a machine which is thus described:—

"In punching holes in metal plates for ships boilers and other purposes, it has hitherto been usual to mark on the plates by hand all the spots where holes are to be punched. In punching plates for ships, a great difficulty also exists, from their curved shape necessitating the punching of the holes in the various plates at different distances apart. Now, this invention consists in punching holes in manner and by the machinery hereafter described. Upon standards in front of the machine, the patentee fits a table free to travel to and fro, upon which the plate to be punched is laid; the plate must previously be marked at the two spots between which holes are to be punched, for instance, for the holes for the rivets which secure a plate to the ribs of a ship. Above the plate, and bolted to or forming part of the punching machine, is a bed-plate having fixed thereto a frame or apparatus by which the space between the two marked spots is divided, as hereafter described, into as many equal distances as there are holes to be punched. This frame or apparatus is composed of two longitudinal bars, free to move upon, as fixed centres, near one end thereof. The shorter arms of these longitudinal bars are connected by a slotted transverse bar placed at a given distance, say 3 inches more or less, from the fixed centres, the longer arms are divided into spaces of 3 inches or each equal to the given distance just mentioned, and at each division there are holes for securing another slotted movable transverse bar or a wire. The longitudinal bars are drawn out of a straight link or into a position where they form an angle with the line of holes to be punched, when it is necessary to reduce the distance between the holes. When the punching machine is set in motion, it punches a hole in the plate where marked; the table is then made to travel by suitable mechanism, until the hole comes underneath a pin, which drops in the hole, throws the mechanism out of gear, and stops the table, when the punch descends to punch another hole, after which the pin again rises, the same operations are repeated until all the holes are punched, the pin always falling into the hole last punched. Instead of fitting the dividing or regulating apparatus, above described, to a punching machine, it may, slightly modified, be employed simply for marking the spots where holes are to be punched, and the punching may then be performed by any ordinary method."

The Owners of a Boiler convicted of Manslaughter.

The Birmingham correspondent of the London *Engineer* writes :—

"The inquest on the bodies of the twelve men and boys killed by the explosion of a boiler at the Hall-End Iron-works (near West Bromwich) of Messrs. Thomas and W. E. Johnson, has resulted in a verdict of manslaughter, as well against those gentlemen as against their engine-tender, William Bagnall. The coroner (Mr. Hooper) in sending the case to the jury, said that the scientific evidence went to show that the explosion had taken place from over-pressure, and not from want of water; and the other evidence seemed to point to the fact that, at the time when the explosion took place, William Bagnall was sober, although he had been drunk on the previous day. It was his duty to tell them that, if they believed that the defective state of the boiler was brought under the notice of Thomas Johnson and W. E. Johnson, and that they had taken no practical notice of the information, it would be their painful duty to return a verdict of manslaughter against those persons; but if they were not clearly satisfied, they must give them the benefit of the doubt. The coroner concluded by remarking on the high character of the scientific evidence adduced. After the jury had deliberated for about two hours and a quarter, the public and parties interested were readmitted into the court, when the coroner said that the jury, having carefully considered the evidence before them, returned a verdict of manslaughter against Thomas Johnson, sen., the proprietor of the Hall-End Works, and his son, William Edmund Johnson; and also against the chief engineer, William Bagnall, *alias* Bagley. That was the verdict of seventeen out of the nineteen jurors as regarded Messrs. Johnson, and the whole of them as respected Bagnall, the engineer. As regarded the verdict, he himself had arrived at the same conclusion, and he believed it to be a strictly honest, just, and impartial decision. The Messrs. Johnson and William Bagnall were admitted to bail on two sureties of £100 and themselves in £200. The inquiry lasted until half-past one o'clock."

Genius and Cooking.

A "cook and housekeeper," named Katy Liddle, of No. 7 Comelybank, Edinburgh, has lately filed the following provisional specification in the Patent Office. The Commissioners of Patents have, however, refused provisional protection. Katy says:—"I get a tinsmith or other competent person to make for me, of any suitable material, an egg or saucepan constructed with a second bottom placed on a framing inside, two or three inches above the bottom of the pan, in which second bottom are made one or more holes, according to the size of the pan desired, to receive the bottom of as many small tea-cups placed in the holes made large enough to allow the cups to be immersed in the boiling water up to the middle of the cup. I place this pan on the fire, with water sufficient to cover the upper bottom, and let it boil; I have ready the number of eggs required to be cooked, with a small tea-cup for each egg. This tea-cup I dip in boiling water but without leaving any or very little of the boiling water in it, and I then break the egg in the usual way and place it in the tea-cup, and I do the same with all the eggs I have to cook. The tea-cups with the eggs in them are then placed in the pan in the holes made for them in the second bottom, as above mentioned. I carefully watch to see the egg done to the precise degree of doing it according to the taste of my master, which generally takes not quite so much time as does the ordinary method of boiling an egg in the shell. My master thinks this a very superior method of cooking an egg. He says that it very much improves the flavor as compared with the ordinary method of boiling an egg in the shell; it is also so nice and clean-looking, and you can also by it always and at once detect an unsound or imperfect egg. As compared with the usual method of poaching an egg, every one admits that my method is a decided improvement. My master is at pains to show it off to any friend or friends who may be visiting him, whether it be at breakfast, or at dinner, or at supper, by having an egg cooked for each friend after the manner I have described above. He likewise says that it makes the egg so light and easy of digestion that he thinks a man might with ease eat half-a-dozen at a meal without any injurious consequences."

Great Coal-oil Case.

Our English exchanges contain full reports of the important case of Young *vs.* Fernie, which involves the originality of James Young's patent for distilling paraffine or kerosene oils from Boghead and other coals. A large amount of evidence has been taken on both sides of the case, and numbers of chemists and experts have testified—some on the side of Young and others on that of his opponent. What renders this case important is that some of the most widely known chemists express the conviction that Young's invention was really novel, while others, equally eminent, declare it to have no novelty whatever, and that his process had been used many years before his patent was granted. The decision of the court in this case will be regarded with much interest, for business operations of great magnitude are involved in the result. The diversity of the scientific witnesses affords a commentary by no means pleasing, and suggests the unpleasant reflection that individual opinions frequently override what science teaches as fact, and the followers of science often ignore the instructions which they should have thoroughly digested and appropriated, and descend to expressions of opinion outside their sphere.