A LECTURE ON THE IRON NAVY OF GREAT BRITAIN.

The following are extracts from a lecture lately delivered on the above-named subject by J. Scott Russell, Esq., before the Leeds (England) Philosophical and Literary Society.

Mr. Russell stated he was not sure that they had a fleet capable of protecting their commerce from clever, smart, well-handled, and fast pirates like the *Alabama*. The first question was, were wooden ships-of war worth anything for purposes of warfare? Sir John C. Hay, the chairman of the committee appointed by Government to make experiments on the effects of artillery upon iron armor, uttered this fatal sentence upon wooden fleets:—"The man who goes into action in a wooden ship is a fool, and the man who sends him there is a villain." The worthlessness of wood ships came from their combustible nature, and arose mainly from the invention in modern times of horizontal shell firing, which could be discharged with tolerable certainty at distances of two, three, four, and even five miles. They could, however, make iron ships incombustible. A plate an inch thick had been found to take the sting out of a shell altogether. A cast-iron shell eight inches in diameter, weighing 68 lbs., and fired with a charge of some 16 lbs. of powder, at a distance of from 200 to 500 yards, would be carried with a velocity of 1,600 feet a second, and the question was, how to stop it? Many theories had been proposed to stop the shell by coaxing, that was, by pieces of india-rubber, by bales of cotton, blankets, and other mollifying substances, but it had been proved that nothing would induce it to stop but presenting another piece of iron as strong or stronger than itself; and therefore to stop a 68 lb. shell they must take so thick a plate of iron that the piece struck by it should weigh more than 68 lbs. It was then a question of strength—if there was a certain quantity more of iron in the plate than in the shell, the plate had it, and *vice versa*, but if the plate were hit three or four times in the same place it would probably give way. Mr. Whitworth had been enabled with his cylindrical shot, under peculiarly favorable circumstances, just to punch through an iron plate of 4½ inches. Of all the hundreds of shots fired in action, very few would have similar fortunate circumstances, and they might, therefore, comfort themselves with the feeling that at present 4½-inch iron plates were practically shell-proof. When 4½ inches were penetrated by ordinary guns, they must make thicker armor, and to carry it they must build bigger ships, or limit the battery to a smaller portion of the ship.

The first case which came to their knowledge of the destruction of a wooden fleet by horizontal shell firing was the destruction by the Russians of the Turkish fleet at Sinope. During the same war, Louis Napoleon got his iron-plated ships into the Black Sea before England, and had the opportunity of practically testing them. He was enabled to capture Kinburn, and it was afterwards found that in no one place had the shot from the fortress penetrated the armor of the two ships engaged in bombarding it. Immediately after this experience, Napoleon made up his mind to have armor-plated ships, ceased spending money upon wooden ships, saved that money until he perfected his design, and the consequence was that he had got an iron fleet before we knew anything about it. What did we in England do? No sooner was this found out than they set to work building wooden ships as fast as possible, and the sum expended in this way since Napoleon began saving his money was 29 millions odd. (Laughter.) A list of the "magnificent fleet which now defends England" had been recently published, and it amounted to 1,014 ships of war. This was a very formidable inventory, but he could give them a simple analysis of the number. Of these 1,014, there were of wooden ships 1,010—(laughter)—of fast iron ships, two; and of slow iron ships, two. This was what they now had for the 29 or 30 millions expended since the discovery that wooden ships were incapable of sustaining horizontal shell firing. There was happily promise of better for the future. They were now constructing of the *Warrior* class four, of the slow class four, and of wooden ships coated with iron ten. He thought this was a very serious subject. The country was spending ten millions a year upon the navy, which was equal to a fleet of ten *Warriors*. A fleet of twenty *Warriors* would be more powerful than the whole of the 1,010 wooden ships put together—it would be maintained at a quarter of the cost of the wooden ships; and he would go further, and say that three fleets of twenty *Warriors* could be maintained for an annual expenditure of little more than half of the ten millions now expended on the navy. They would naturally ask how this was to be accomplished? He replied, they should order the Admiralty to go out of business as manufacturers. They had turned them out of business in one department—the manufacture of marine steam engines—and the economy had been enormous. The French have now six iron-clad frigates afloat; England, four; the former has ten building and the latter about the same number. For armor plates the finer kind of iron was not suitable, that required being a very cohesive metal, which would yield a little to the blow. He saw that day, in one of their own manfactories, some enormous machinery being prepared for the manufacture of these iron plates. If a five-inch plate were penetrated, they would make a six-inch plate, and by-and-bye a twelve-inch plate, and when it became known that what was wanted was a tough and plastic iron, they would obtain as much of the proper quality as they wanted. He thought no large war-ship should be built which was unable to carry coals for a voyage of 5,000 miles.

The opinions of J. Scott Russell are entirely opposed to those put forth by Mr. Wells, Secretary of the U. S. Navy, respecting Government engineering establishments. His statements deserve much candid consideration.

The Calorific Effect of Silicious Sand in the Boiling of Water and Generation of Steam.

The following is a communication from the pen of Calvin Pepper, Esq., of Albany, N. Y.; the conclusion of the article, together with some editorial comments on the same, will be published in our next number:—

The subject of facilitating and economizing the boiling of water and the generation of steam by simply placing pure silicious sand in the vessel containing the water, from recent experiments made and now being further prosecuted with all diligence, is replete with interest and practical importance. In view of these experiments I am already warranted in saying that with any vessel—however large, not less than two inches in diameter, and not containing less than one gallon of water, admitting two inches in depth of sand—I will boil water in any given quantity, and convert it into steam in one-third less time and with one-third less expenditure of fuel, by the use of sand than without it; all other circumstances being equal.

The following experiments are sufficiently illustrative to serve as a text for the brief exposition which follows, and to prove suggestive of explicit inquiry and experiment on the part of your intelligent and scientific readers. The vessels used in all these experiments were two ordinary tin cylinders of like make, ten inches in diameter, with copper-pit bottoms, each capable of holding three gallons of water. In the pit of one was placed a pint and a half of sand, covered over with fine wire gauze, to hold the sand in its place and yet permit free circulation of the water from above through the meshes into and out of the sand. This addition of sand to one of the vessels was the only difference between the two. The sand used was of mimimum quality:—

The undersigned made the following experiments with C. Pepper's silica attachment for boiling water, generating steam, &c., as very readily and very simply applied by him to any vessel containing water to be placed over any fire. Two ordinary vessels in all respects similar, with the only difference that the one contained the silica in the water and the other not, and each containing six quarts of cold water, were placed upon the fire range, side by side, at the same time, and changed—the one in the exact place of the other—every two minutes, so that the conditions of heat, as applied to the two vessels, should be made as equal as possible. The water in the silica vessel was boiled in 13 minutes, and in the vessel without the silica it required 23 minutes. One gallon of hot water was then removed from each vessel and replaced with a gallon of cold water, and the same quantity of potatoes placed in each at the same time. Again the water was much the soonest boiled in the silica vessel, and it required but 18 minutes to boil the potatoes fit for the table in that vessel, and 29 minutes in the other vessel. The vessel with the silica maintained its superiority in heating, boiling and cooking in the above relative proportions throughout, and in every stage of the experiments. The experiments were performed with the utmost care and circumspection at the Delavan House, Albany, N. Y., July 28, 1862.

WM. RACE, Steward of Delavan House, Albany.

The following tests were made at the store of Fuller, Warren & Co., Troy, on one of P. P. Stewart's stoves, July 31, 1862. The vessel tried as an experiment had, as near as I could judge, one pint and a half of sand at the bottom, covered with brass wire gauze. J. A. LAWSON.

First, At 2*h*. 17*m*. each vessel, containing four quarts of water, was placed on the stove without any cover or lid, changing the position of the vessels every two minutes. At 2*h*. 36*m*. the vessel with sand boiled; at 2*h*. 44*m*. the vessel without sand boiled. Second, At 2*h*. 45*m*. two quarts of cold water were added to each; and at 2*h*. 51*m*. the water boiled in the sand vessel, and at 2*h*. 69*m*. in the other vessel. Third, At 3*h*. 12*m*. two quarts of water were taken out and two quarts of cold water put in—the vessels being this time covered; at 3*h*. 16*m*. the vessel with sand boiled, and at 3*h*. 22*m*. the vessel without the sand. Fourth, At 3*h*. 23*m*. two quarts were added to each vessel; at 3*h*. 27*m*. the water boiled in the sand vessel, and 3*h*. 28*m*. in the other. Fifth, At 3*h*. 30*m*. two quarts were taken out of each vessel, and two quarts of cold water added; at 3*h*. 32*m*. the water in the sand vessel boiled, and at 3*h*. 35*m*. the water in the vessel without the sand boiled. Sixth, At 3*h*. 37*m*. four quarts were taken out and one gallon of cold water added. The water in the sand vessel boiled in one minute, and that in the vessel without sand in three minutes. Seventh, At 3*h*. 41*m*. one gallon of water was added, and at 3*h*. 48*m*. the water in the sand vessel boiled, and at 3*h*. 50*m*. that in the vessel without sand boiled. I believe the above experiments were fairly made, and the results, as stated, seem undeniable. P. P. STEWART.

In the application of the sand it should be observed:—

First: The sand must be pure silica. No other substance can supply its place or possess the same or equal heating properties in common. Earths soluble in water, as clay, marl and dirt, become plastic and impervious to water and heat, the injurious effects of which are well known.

Second: The sand must be placed next the fire, with but the metal intervening, or, in other words, the sand must heat the water and not the water heat the sand. It will not do to suspend the sand in the water, or have it remote without continuity from the source of heat, or its direct application, or where it cannot be readily raised to 212° of temperature.

Third: There may be excess of sand as of metal, abstracting heat without rendering back that which would otherwise be applied to the water. A little practical knowledge will always avoid that error.

Fourth: If the sand surface be small, or the space filled in with the sand narrow and of much depth, as, for example, between the outside and inside fire-boxes of a locomotive engine, there may be such rapid generation of steam as to prevent the water from circulating from above down through the sand, but this can always be remedied, and the circulation actually increased in force and completeness, by having water rise from the bottom of the sand by hydrostatic pressure upwards, acting in conjunction with the force of the steam.

(To be continued.)

APPLICATIONS FOR THE EXTENSION OF PATENTS.

The following persons have applied to the Commissioner of Patents for the extension of their patents for a term of seven years:—

Method of Insuring the Action of the Valves of Direct-action Pumping Engines.—Henry R. Worthington and William H. Baker, of Brooklyn, N. Y., obtained a patent on April 3, 1849, for a method of insuring the action of the valves of direct-action pumping engines. The said H. R. Worthington and Adelia C. Millar (executrix of W. H. Baker), of Fruit Hill, R. I., now pray for the extension of the patent. The testimony will close on March 2d, and the petition will be heard at the Patent Office on the 16th of that month.

Tool for Attaching Tubes to Boilers.—Thomas Prosser, of New York, obtained a patent on April 17, 1849, for an improved tool for attaching tubes to boilers. The testimony will close on March 16th, and the petition will be heard at the Patent Office on the 30th of that month.

Persons who wish to oppose the extension of these patents should attend to it without delay. Copies of the claims in each case will be promptly forwarded from the Scientific American Patent Agency upon the receipt of $1.

TAPIOCA is the gum or sediment of the juice of the Mandioca plant, found in Brazil. The juice is obtained from the tubers which are about a foot in length and resemble sweet potatoes.