and every unbiassed man will sustain us in this position. Men eminent for talents and scientific attainments frequently fly off at tangents and waste both time and learning in profoundly useless speculations. Let us give a case to the point. A few years since one of the most distinguished professors in Oxford published an anonymous tract on the "Plurality of Worlds," in which he attempted to prove scientifically that the Earth alone was inhabited, and that none of the other planets were in a fit condition for the existence of sentient beings. To this pamphlet the Rev. Baden Powell, F. R. S., published a long reply, and Sir David Brewster, another, in a volume of no inconsiderable size. The latter *savant* (whose work has been re-published in this city) endeavored to prove scientifically that not only the planets, but the very Sun itself may be inhabited. We believe there is not a man of plain common sense in our land who can doubt the assertion, that the efforts of these very eminent scientific gentlemen, on this subject, were a "waste of mental power, and a misdirection of learning."

It is evident that the correspondent of the *Railway Review* is not a frequent controversialist, as he takes cases from experimental philosophy as arguments for speculative philosophy; he is like a counselor using opposing evidence in proof of his case. Thus, he cites Franklin's experiment with the kite and the lightning, and Prof. Henry's with the electro-magnet, as bearing against us, while they are the very kind of investigations we have commended. Science is built on truths, but some truths are certainly more valuable than others, just as a man "is of more value than many sparrows." We have spoken against the undue prominence given to certain scientific subjects of little value, because they excluded the consideration of others possessing more importance. By elevating paltry scientific subjects to a position with those of paramount consequence, general science is subjected to contumely. The correspondent of the *Review* exalts the speculators in the fossil foot-prints to the dignity of benefactors to the coal-miners who furnish fuel for our engines, and as a sequence "newspaper makers" are also held to be the recipients of their benefactions. We exclude such an idea; we consider the miner to be the geologist's "best friend," not the latter the best friend of the former, as he has been called.

The correspondent of the *Review* is in error, we believe, in one statement. He says: "The mere apparently useless truth that the tubes of the cellular tissues of plants were concentric and shut into one another, led, as is well known, to the greatest improvement in the art of ship-building that this country has made." Such an improvement is certainly unknown to the public.

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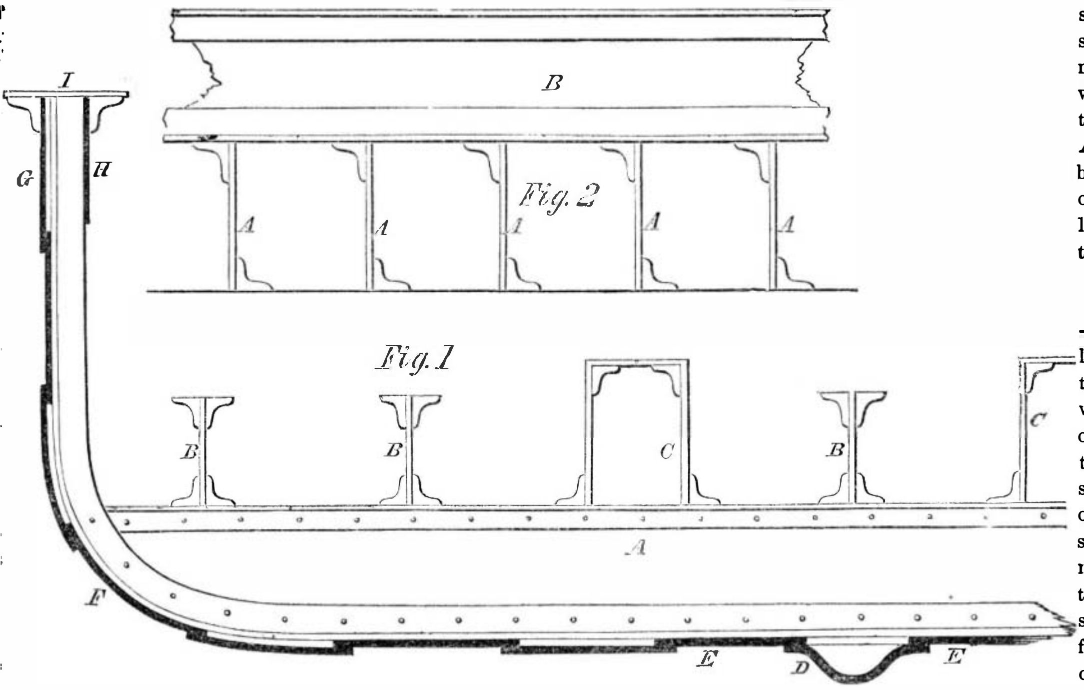
IRON SHIPS.

The question has been frequently asked why it is that the Americans, who had obtained the lead of the whole world in the art of shipbuilding, have shown so little interest in the experiments which have been made in the use of iron in this art. It may be that the success of our shipbuilders had filled them with some of that conceit which is characteristic of the older nations, and they had got above learning anything from other people. If this is so, they have reaped the natural reward of their folly in the triumph which the English and Scotch have won over them by the adoption of a better material. It is gratifying to see that our people are at last beginning to arouse from their strange lethargy, though with a tardiness which is certainly not characteristic of them, and are beginning to adopt this great improvement. Commodore Vanderbilt has just had an iron steamer built, and two more are being rapidly finished in this city. One of these is the steamer *Alabama*, built by Samuel Sneeden, at Greenpoint, to run on Lake Ponchartrain. As the building of iron ships, now in its infancy, is destined to grow up with a rapidity probably unparalleled even in this country, we presume our readers will be interested in a plain account of the way in which they are made. We have, accordingly, obtained from Mr. Rowland, the engineer who superintended the building of the *Alabama*, a full description of the iron hull of that boat, which we present, illustrated by an engraving.

This boat is constructed in the same manner, substantially, as a steam boiler, with a single thickness of plates of iron riveted together where they lap at the edges. The structure is then braced lengthwise and crosswise in an exceedingly simple manner, which will be readily understood by inspecting the engravings. Fig. 1 is a cross section of the hull, and Fig. 2 is a longitudinal section of a portion of the keelsons. Directly on the bottom of the vessel are placed the cross keelsons, 16 inches apart. The ends of these are shown in Fig. 2, A A A, and the side of one in A, Fig. 1. They are made of plates of iron 12 inches deep and 5-16 of an inch in thickness, set on their edges, strengthened at top and bottom with angle iron, and extending across the boat. The angle iron is 5-16 of an inch in thickness, and measures three inches on each side; that is to say, it is made of a bar or plate of iron six inches wide, bent at an angle in the middle. Five fore-and-aft keelsons, constructed in the same manner as the cross keelsons, only that they are strengthened with four rods of angle iron instead of two, run the whole length of the boat, standing on their edges on the top of the cross keelsons. Besides these, two box keelsons, C and C, 17 inches deep and 16 inches wide, made of plate 5-16 of an inch thick, and strengthened with bars of angle iron as shown in the cut, extend the whole length of the vessel on each side of the middle.

The plating is 5-16 of an inch in thickness, with the exception of the bent piece, D, which forms the keel, which is $\frac{5}{8}$; the garboard strake, E E, which is $\frac{1}{2}$; the bilge strake, F F, which is $\frac{3}{8}$; and the wales, G G, which are also $\frac{3}{8}$ of an inch thick. The side are strengthened with ribs of angle iron 16 inches apart, $3\frac{1}{2}$x$3\frac{1}{2}$ and $\frac{3}{8}$ of an inch thick, extending across the bottom at the angle of the cross keelsons, and firmly riveted to the outside plating and to the keelsons. Opposite the wales on the inside edge of the angle iron ribs, a clamp, H H, 20 inches deep and $\frac{3}{8}$ thick, extends around the vessel. On the top edge of this and the wales is placed a covering plate, I I, 13 inches wide and $\frac{3}{8}$ thick, also extending entirely around the boat, and strengthened with angle iron. The holes for the rivets in the plating are countersunk on the outside to receive the tapering rivet heads and make a smooth surface. To make the seams of the plating water-tight, after the riveting is done the edge is cut straight with a cold chisel, and is then upset with a blow on a blunt chisel or tool, in the same way that a steam boiler is finished. The stern, stern-posts and the rudder are all made of wrought-iron. Four water-tight bulkheads, made of $\frac{1}{4}$-inch plate and strengthened with $2\frac{1}{2}$x$2\frac{1}{2}$ angle iron, extend across the vessel.

The *Alabama* is 225 feet long, 32 feet beam, 10 feet depth of hold, and measures 630 tons. Her draft when launched was 28 inches. The increase in the cost above that of a wooden vessel was about 30 per cent, if reckoned on the hull alone; but this increase, if reckoned on the total cost of the vessel, amounts to only 10 per cent. Iron vessels are not coppered, but are simply painted with either red lead or zinc paint. They require painting about once a year. So far as we know, they may last hundreds of years. One was taken up in the Clyde, which had been to sea 10 years, and the statement was that she had never leaked a drop, and was as good as she was on the day she was launched. A ship made of iron is better in every respect than one made of wood; it is lighter, stronger, sharper, tighter and more durable.



IMPROVEMENTS IN IRON SHIPS.

A New Steam Boiler.—Joseph Harrison, of Philadelphia, a Russian contractor, cotemporaneous with the Messrs. Winans of "cigar-steamer" notoriety, has recently constructed and put into operation a newly-devised steam boiler, which, for novelty and probable utility, equals the "ocean shuttle" of his Baltimore friends. It consists of 300 cast-iron globes, six inches in diameter, connected together by tubes two or three inches long. Though the projector alleges perfect safety from explosion and an actual saving of 300 pounds of coal per day for 25-horse power, it is difficult to conceive how thick cast-iron can generate steam faster than the thin copper tubing of a locomotive boiler, or how it is easier to keep the right quantity of water to prevent explosion in 300 bombshells than in a single boiler.—*New York Tribune.*

[Our cotemporary is perfectly right about the inferior conducting power of cast-iron in comparison with copper, or even with wrought-iron tubes, and we must also say this is not altogether a new steam boiler. It is similar in principle (though somewhat different in construction) to Franklin's "duplex steam generator," illustrated on page 192, Vol. VII., of the Scientific American.

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HOW TO MAKE HARD WATER SOFT.

One of our city subscribers—noticing in No. 12 of the present volume, Scientific American, an article on the above subject—called upon us and stated the fact that over 20 years ago a well was dug, 20 feet deep, on the Cottage Hill Farm, near Ravenna, Ohio, upon which he resided. It contained eight feet of water—after being stoned—the earth about which was blue clay, and the water was very hard. This serious defect was cured entirely, and the water softened permanently, by putting into the well four feet of gravel of the size of beans and upwards. He thinks this a sure remedy in all such cases, and wishes the fact made known through the Scientific American from Maine to California. If our informant's experiment was thoroughly made, and is correctly stated, no doubt the same results would be produced in all cases in which the essential circumstances are precisely the same, but we do not believe that his plan will render all hard water soft. When foreign substances are held in mechanical suspension in the water, a layer of gravel stones at the bottom may allow such substances to settle, but if the foreign matter is held in solution, the gravel could remove it only by getting into chemical combination with it, which would seldom occur.