

that Mr. Edwin Clarke deduced, from experiments made in connection with the Britannia-bridge, that it would require 24 tons to shear a rivet of 1 square inch sectional, it will be seen that the bolts which have a sectional area are nearly double; 1.76 in. are ample. Mr. Fairbairn gives something less; but taking the very minimum, there can be no fear of the plates shearing or dragging the bolts unless the elasticity of the timber back should, in the course of time, allow of too much play. The bolts are provided with screws on the inside, and nuts, so that the plates could be tightened. Nevertheless, the system of fastening receptacles is the weakest point in the whole method of construction. Both the "Achilles" and "Royal Oak"—the iron and timber ships—are plated in the same manner, and certainly nothing can surpass the workmanship. The plates are close home, and fit to one another with the greatest accuracy. They require no caulking or cement to hide the seams, like the "Warrior's." Plated from stem to stern, these new iron-sides are a great improvement on the "Warrior," and their sides as smooth and slightly looking as any timber ship, with the exception of the sterns. The stern of the "Achilles" is not yet up, but that of the "Royal Oak" is as ugly as it is possible to imagine. It resembles nothing so much as the stern of a dummy at any of the landing piers on the river. It doubtless has its use, though it must prevent fire from the main deck in the same vertical plane as the keel—a faculty not to be despised in a stern chase. What makes the workmanship of the plating so noteworthy is that it has been executed by shipwrights. Some time back the engineers, to the number of 90 struck work. They were allowed to go, and their place supplied by shipwrights, who were doubtless glad of the chance, for they saw their trade threatened with extinction, consequently they took to their new trade with a will. In a couple of days they could drive rivets as fast and as well as a regular boiler-maker, and they may be now seen sledge hammering, punching, drilling, planing, and shaping iron, as if they had never done anything else all their lives. The lesson is a useful one, both for men and employers. It shows that among intelligent workmen the division of labour need not preclude the attainment of proficiency in several branches of handicraft by the same individual.

The stern post of the "Achilles" is a magnificent forging, and a marvel of Cyclopean working in iron, but its very massiveness and weight fills the visitor with apprehension for the safety and durability of the ship to which it is to be fixed. Placed at the extreme end of the keel, and as far as possible from the fulcrum, it must exercise great leverage, and shake the ship terribly in foul weather. So forcibly does this idea take possession of the mind, that one is disposed to ask whether it would not be possible to build the stern-post cellular fashion, of thick plates riveted together, and stiffened by stays and braces inside; or whether it is absolutely necessary the stern-post should be rectangular in construction; might it not be cylindrical and constructed after the fashion of Captain Berkeley's guns—*i. e.*, of tubes shrank in one over the other until the requisite strength and stiffness are obtained?

THE WIDNES SOAPERY, NEAR WARRINGTON.

In continuation of our series of reports upon the manufacturing establishments engaged in the production of articles which are furnished to the public through the medium of our special patrons, the grocers, we have lately availed ourselves of an opportunity to extend our inspection to that part of the kingdom (Lancashire) in which the manufacturing industry of our countrymen has taken a development previously unexampled in this or any other country; and, although the great staple production of this county is at present in a state of depression, from which all must suffer, we trust this cloud will quickly pass away, and that our friends in that district will soon find the consumers of their articles restored to them as independent customers.

We commence with a report upon the soap works of Messrs. William Gossage and Sons, and shall follow this up at intervals by descriptions of other interesting establishments in the neighbourhood.

We had the good fortune to be conducted over this establishment by the junior partner, Mr. F. H. Gossage, whose whole time and attention are devoted to the manufacturing department of the business. We received from this gentleman the most complete details of the different operations, evidently explained to us with the desire that they should be fully comprehended. We were informed that the works, as a soap manufactory, were commenced on a small scale in the year 1855 by the head of the firm, Mr. Gossage, sen., whose long experience as a manufacturing chemist is well known, and whose position in this capacity was fully recognised by his being selected by the Royal Commissioners for the important appointment of Juror to assist in deciding upon the relative excellence of the various products submitted to the Chemical Class of the recent International Exhibition.

In the year mentioned, the war between our country and Russia was raging, and, as a consequence, the value of all kinds of fats and oils used in the manufacture of soap was greatly enhanced. Mr. Gossage directed his thoughts to finding a substitute possessing some of the properties of Russian tallow, and thereby decreasing to some extent our dependence upon Russia for a supply of this article. Mr. Gossage found that the compound known as soluble glass, or silicate of soda, was possessed of high detergent powers, and, when prepared and applied in a suitable manner, it proved to be a highly valuable compound for combining with ordinary soap. It was explained to us, that this compound is analogous, in several of its properties, to soap made from tallow and soda inasmuch as ordinary soap is a substance in which the alkali (soda) is held in a state of weak combination with tallow, and, therefore in a condition to exercise its well known cleansing power. In the like manner, silicate of soda is a compound in which soda exists in a state of weak combination with silica, thereby retaining its cleansing power, just in the same manner as it does ordinary soap. Mr. Gossage, having satisfied his mind of the correctness of these facts, devoted his attention to the means of preparing the silicate of soda of proper quality, and to the best manner of combining this with ordinary soap, so as to produce a compound soap