

driven by the vacuum process alone, in all cases by the plenum, and sometimes both might be employed with advantage; and the driving could be further aided by the use of mechanical pressure or weight. The support which such columns derived from their exterior frictional surface in ordinary earth was, as previously stated, at least equal to $\frac{1}{2}$ a ton per square foot, but in the finest earth it would amount to 3 tons.

The support from the area of the bottom in shallow depths was from 5 tons to 10 tons per square foot; and at the great depth to which these columns would be ordinarily sunk, it must be considerably more.

TERRA COTTA, AND ITS EMPLOYMENT AS A LONDON BUILDING MATERIAL*

BY GILBERT R. REDGRAVE, ARCHITECT.

In a report on Class 65 of the Paris Exhibition, treating more especially of terra cotta, I find this passage:—That history repeats itself is shown by the revival of the use of terra cotta. Four thousand years ago baked, cooked, or burnt earth—terra cotta—was common enough in Egypt, and was the building material of that people. It was used by the Greeks, by the Romans, and by various European countries in the Middle Ages, and now, in the Paris Exhibition, proofs are afforded in all parts of it, that modern Europe is largely reviving the use of terra cotta." Mr. Cole might have claimed even greater antiquity than he does for burnt clay, for it was of this material that the earliest building mentioned in history was constructed. "The people," we are told in the twelfth chapter of Genesis, "found a plain in the land of Shinar and dwelt there, and they said one to another, Go to, let us make bricks, and burn them thoroughly, and they had brick for stone, and slime had they for mortar. And they said, Go to, let us build us a city, and a tower whose top may reach unto heaven, and let us make us a name, lest we be scattered abroad upon the face of the whole earth." Sun dried and baked clay was employed by nearly all the great nations of antiquity in their early works. The granaries and storehouses of Egypt, the vast mounds of Nineveh and Babylon, and the aqueducts and other remains of Roman times, testify how widespread was its use. Nor was burnt earth used merely as a material for building. Strange to say, this clay, in itself so friable, when properly treated by man's intelligence becomes the most durable of substances, and has been the means of treasuring up the documentary records of a monarchy of which other direct records have wholly perished—the means of handing down to us the art of a people whose very history is lost, and whose race and era are disputed questions. I speak of the clay cylinders of Nineveh and the fictile vases of Etruria. Whoever has examined those cylinders, whereon are marvelously impressed, in characters still sharp and clear as when they were first produced, the names and acts of rulers who flourished 3,000 years ago, will need no further proof of the durability of terra cotta, while our own museums and those of other continental nations are full of wonderful evidences, in their collections of Etruscan vases and tazze, not only of the beautiful art, the refined taste, and the poetic imagination of that mysterious race, but also, of the judgment with which they selected the most durable material in which to hand them down to future ages.

As to the building material of the ancients, this seems remarkable—that before they learnt the use of the native products, the stone and marble that so universally abounded, a sort of natural instinct seems to have led them to temper the clay, to knead and mould it, to bake it in the sun, and burn it in the fire—in fact, to manufacture a material, rather than to use a natural one. In nearly all the instances I have been alluding to, the substance is spoken of as brick, and I am now naturally led to investigate the difference, if any, which exists between clay burnt into brick and clay burnt into terra cotta. I find it extremely difficult to define this difference, and still more to give any general rule which should enable the unskilled observer to distinguish at once between brick and terra cotta. The same clay undergoes the same general preparatory processes, and partly from more care and attention in the shaping and firing, and partly from the use only of the purest portions, the resulting material is known in the one case as terra cotta, while, in the other, it is simply brick. The

truth is that the finer grained fire-bricks, and the hardest and best qualities of red bricks, such as those made from the Hampshire clays, are terra cotta; and many of the second rate and softer varieties of terra cotta, more especially those of a light red colour, are unworthy of the name, as it is at present understood, and are even, if anything, inferior to brick. While referring to the hardness of terra cotta, I may call attention to a test of this quality which should be made binding on manufacturers, namely, that it should resist the scratching of a pin, and if of a superior quality, that of an iron point.

About the commencement of the present century Messrs. Croggan had an establishment in Lambeth Marsh, for the sale and manufacture of artificial stone ornaments. The composition of this stone was a secret; but I find in the "Somerset House Gazette" for the year 1824, an interesting account of a visit to Messrs. Coade's, late Croggan's, gallery of artificial stone ornaments. The writer speaks of the many articles for which this material may be employed, and enumerated, among the objects exhibited, "ornamental figures, enriched vases, baptismal fonts, garden fountains, and capitals of pillars of the different orders, of all sizes." He tells us that "there was considerable shyness about the composition of this artificial stone, but chiefly as to the proportions of the ingredients. Some articles are first formed roughly to give them the external shape in a mould, they are then polished by the chisel while in a soft state, which they endeavour to preserve by wrapping the block carefully in wet cloths. In some cases particular enrichments prepared in matrices are added, and in others the whole is nearly the work of the hand." He seems to have some notion of the material, for he goes on to say:—"The process seemed very much like what I had observed in Mr. Chantry's workshops, in modelling the designs in clay, for the future marble to embody." He tells us that "after the figure is completed in all its parts, it is cut into several pieces for the convenience of introducing it into the oven, and is afterwards put together, firmly cemented, and iron rods introduced into the arms or other parts that may require to be strengthened." He concludes his remarks on this part of his subject by stating the durability of the material to be fully equal to the ordinary kinds of stone, and expresses an opinion that, when the power of the composition to resist the influence of the weather is fully ascertained by a longer experience, it will encourage the more general use of it and give employment to a higher class of workmen. This account of Coade's terra cotta naturally led me to endeavour to find out some buildings of this period in London, whose enrichments have been executed in this material, and I was fortunate enough to find in Pugin and Britton's "Public Buildings of London," in the description of St. Pancras Church, that "the capitals to the columns and antæ, and all the external ornaments, enriched mouldings, &c., are of terra cotta. Imitations of Greek tiles in terra cotta are ranged along the coping of the side walls, as well as round the circular part of the east end;" and in the part describing the colossal statues of females guarding the entrance to the catacombs, there is the following footnote:—"The above figures are of terra cotta—they were formed in pieces, and cemented together round pillars of cast iron, which, in reality, support the entablatures." We also learn from this work that Messrs. C. and H. Rossi were paid £4,300 for terra cotta ornamental work. St. Pancras Church was roofed in in 1820, and finally completed in 1822. Although I have not yet been able to ascertain much on the subject of Messrs. C. and H. Rossi, or of their manufactory, we have in the above facts some most interesting data with regard to terra cotta work in London.

The whole of the exterior of St. Pancras Church is faced with Portland stone ashlar work, and is a splendid monument of the superior durability of terra cotta work as contrasted with one of our best English building stones, as all can compare the sharpness and freshness of the terra cotta, with the worn, bleached, and disintegrated stone. The blocks used are some of them of large size, and are remarkably truly and squarely fired. The blocks forming the caryatides do not appear to have contracted very evenly in baking, and have been chiselled considerably in places to conceal the joints. This is always a great mistake, as the outer surface or coat of terra cotta gets slightly vitrified in the kiln, and the face thus formed resists the action of the weather far better than an artificial face formed with the chisel. Indeed terra cotta always exhibits the parts where the exterior has been cut or rubbed

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