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CLEVELAND IRON INDUSTRY AND ITS FOUNDERS.

The rapid growth of the iron manufacture in the North Riding of Yorkshire, England, is one of the most remarkable features of the history of the trade. It commenced in 1850; in the next year 187,950 tons of iron were taken out of the mines; in 1856 the yield was 1,690,000 tons; and in 1870, 1,695,377 tons of pig iron was made in the district. Under this remarkable development, it is natural to expect that large fortunes have been made, new towns sprung up, and industrial establishments of all kinds organized. Middlesbrough, a town in the center of the trade, has aggregated a population of 40,000, while the whole district has increased from 20,000 to 250,000.

Bolckow and Vaughan have always been the chief iron-producing firm in the Cleveland district. They employed for many years not less than 10,000 hands, paying \$5,000,000 a year wages, and running a large proportion of the 150 or 160 blast furnaces in the neighborhood. The business is now in the hands of a stock company.

Mr. Bolckow, who was elected, in 1868, to represent Middlesbrough in Parliament, was born at Sulten, in Mecklenburg, Germany, in 1806. In 1821, when only fifteen years of age, his parents placed him in a merchant's office at Rostock. Here young Bolckow's intellect was developed, and his powers of perception exercised. He had resolved to surmount the difficulties which threatened his further progress; and if knowledge were power, then he would obtain it. It was clear there was no royal road, and individual effort was his only hope of success. He accordingly made the best investment of his capital, which was his mind. He had resolved to make a mark in the world.

In 1827 he commenced business operations in conjunction with an intimate friend and companion, at Newcastle-on-Tyne, and was known as a man who had a high regard for commercial morality, and as possessing remarkable business qualifications. His position enabled him to exercise the splendid abilities with which he was endowed; and at the age of thirty-four, in the meridian of human life, he decided to go in search of a larger field for his labors. Middlesbrough was selected as the center of his operations, and he was fortunate in meeting with the late Mr. John Vaughan, a practical iron maker; and the two entered into partnership in the iron trade. Their capital was not large, therefore their operations were limited, and it required great prudence in the carrying out of their arrangements. The firm erected blast furnaces on a very small scale, in 1841, and commenced the manufacture of iron. The ironstone had to be conveyed a considerable distance, which necessarily increased the cost of production. Just, however, as the matter was claiming the serious attention of the new firm, Mr. Vaughan discovered the Cleveland ironstone. The two partners were delighted with the discovery, but they did not allow their feelings to overcome them. They had an object in view, and firmly united to perform it, the one undertaking the commercial management, and the other the practical part of the business. The firm continued to prosper, and as each year passed additions were made to their works; and although most of the firms were increasing their capital, few, if any, were doing this so rapidly as Messrs. Bolckow and Vaughan. It was their good fortune to prosper so that in the course of a short time they were enabled to multiply their works. Their policy appears to have been to make the most of their limited capital, to win the confidence of all with whom they came in contact, to increase their circle of friends, and, while exercising patience, to be industrious and frugal in their expenditure.

As an employer Mr. Bolckow was generally respected.

Axious at all times to promote the well being of his workmen, he never lost an opportunity of doing good. He often expressed his regret at the improvident habits of his workmen, and endeavored by every legitimate means to impress the desirability of a different course being pursued. It is recorded that he had an intense desire to see every public house closed in the district, and frequently used his efforts to prevent the sale of intoxicating liquors. Whatever may have been his expression on this subject, it is certain his habits were temperate, and he has ever taken a prominent part in the promotion of social, moral, and religious reforms, having for their object the advancement of mankind.

Anxious to improve the educational facilities of the town, he erected schools at a cost of \$35,000, for the accommoda-

and New Orleans. The safe removal of soil is a matter of such sanitary moment, especially in large communities, that inventions for the purpose, proving really meritorious, deserve careful public consideration.

Manufacture of Plate Glass.

The manufacture of plate glass, as now conducted by the Thames Plate Glass Company, at Blackwall, London, is as follows:

The principal successive operations necessary to convert a mixture in the pot into a finished sheet of plate glass are six in number, and may be described under the heads of melting, rolling, annealing, grinding, smoothing, and polishing. The pots are of Stourbridge clay, made on the premises, and are filled with the mixture, the chief ingredients of which are

silica, sand carefully dried, lime, sulphate of soda, broken white glass, and a little arsenic. The sand is obtained from Germany. After remaining in the furnace for about sixteen hours, the contents of the pot are fit for removal. The molten mass is then run over the surface of the rolling table, and the roller passed quickly over it. The glass commences to solidify almost immediately; and while in a thick tenacious condition, and of a rich golden tint, is rapidly transferred into the annealing furnace. The rough sheet, as it may now be termed, is taken from the annealing furnace to the grinding room of these there are several, containing about a dozen grinding stones, or, more properly, beds or tables, upon which the plate is laid flat. The grinding frames consist of wooden boards joined together and armor-plated, so to speak, at intervals over the rolling or grinding surfaces with strips of wrought iron. These strips, when first screwed on to the frames, are half an inch in thickness, and when removed measure less than one eighth inch. The frames are mounted upon a spindle, and a see-saw, semi-rotary movement is imparted to them by shafting running underneath the beds. They are also capable of being shifted by a simple slot connection, so as to work over any part of the surface of the sheet as required. The grinding beds are of stone, and measure about 16 feet by 11 feet. The materials used as the grinding agents are coarse sand, fine sand, and emery. A jet of water plays on the surface of the sheet during the whole of the operation.

Between the grinding and polishing processes there is an intermediate process called smoothing, in which two sheets of glass are employed. One is laid over the other and caused to move over it

in a manner similar to that in grinding. Emery is placed between the two surfaces. On entering the polishing room, the attention of a visitor is at once arrested by the reddish tinge of everything, extending to the dresses of the men and women engaged therein. This is due to the use of the red oxide of iron which is the polishing agent. The sheet to be polished is laid flat on a table, so as to be perfectly flush with the edges. The rubbers are of flannel and mounted on a frame, which carries them backwards and forwards over the sheet. The table, at the same time, has a lateral reciprocating motion, so that the whole surface of the sheet comes successively under the action of the rubbers. The largest plates measure about 15 feet by 10 feet, and the maximum thickness is about 1½ inches. One eighth of an inch is allowed for loss in the operations we have described. A nest of six boilers, and three vertical steam engines, two of 70 horse power and one of 60 horse power, supply the necessary motive power.

On September 2, the volcano Etna, in Sicily, was in violent eruption, which showed no signs of abatement.



H. W. F. BOLCKOW, OF MIDDLESBROUGH.

tion of 1,000 children. Nor is this the only act deserving our admiration. Every charitable institution in connection with the town has had its funds augmented by his liberal subscriptions. The greatest act of munificence, however, was the gift of a park to the people of the town wherein he had acquired his wealth. This cost upwards of \$100,000; and in thus granting so large a portion of his profits, it is an evidence that he was not unmindful of the masses who had contributed to his immense wealth.

The Odorless Excavating Apparatus.

We notice, with pleasure, that the odorless excavating apparatus, illustrations and descriptions of which were published on page 255 of our Volume XXIX., is meeting with a success which appears to substantiate fully the important claims made by its introducers. It has received full indorsement in the reports of the Boards of Health of Washington, Baltimore, and Philadelphia, and is now in constant employment in the cities of Boston, Providence, Pawtucket, New York, Brooklyn, Wilmington (Del.), Baltimore, Washington, Georgetown (D. C.), Charleston (S. C.), Savannah, Memphis,