

Mining, Metallurgy, Mineralogy

AN ANNEALING FURNACE FOR SMALL ARTICLES.

In the report of the Chief of Ordnance for the year 1880, Lieut. Col. Whittemore describes an annealing furnace used at Frankford Arsenal for annealing copper and brass shells, cannon-primer tubes, &c. As the furnace is well designed, and, as will be seen, has proved very successful for its special object, it will no doubt prove of value in many branches of manufacture, where similar operations must be daily repeated with a large quantity of small articles. Lieut. Col. Whittemore has reported as follows: It consists of the furnace proper, constructed of boiler iron, lined with fire-bricks, and arranged with flue and cold blast for draft and heat; of an annealing retort, cylindrical in shape, with closed ends of hemispherical form. From these ends project trunnions, which revolve on friction rolls attached to the furnace. The left trunnion, looking toward the furnace, is hollow, and subserves several useful purposes. It is a peep hole for observing the degree of heat to which the charge is being raised, an outlet for the smoke into which the oil on the shells is converted, a means of obtaining samples for test, and of emptying the charge when sufficiently annealed. The annealing accomplished in this tight-jointed receptacle possesses several advantages over the old plan. In the latter the cylindrical vessel used was pierced with holes and revolved with its charge over a charcoal fire. The surface of the shells became considerably oxidized from exposure to the atmosphere and took up some dirt, as ashes from exterior surroundings during the process. By the new plan the charge is protected from the direct action of the fire, and the gases and smoke generated and expanded inside the retort flow out through the hollow trunnion. By the old method charcoal was necessary as a fuel, to guard against the sulphur and other gases which would be generated from burning anthracite coal. Anthracite coal is used with the new retort, and the shells are annealed with less oxidation of their surfaces, and consequently require less pickling and cause less wear upon machinery and tools in the continued process of drawing. Ten thousand shells or thirty thousand cannon-primer tubes is a full charge for the retort. From 180,000 to 200,000 shells can be annealed in one day of 10 hours, at an expense of about \$5.25. An equal number by the old method would take three days and 6 hours, at an expense of about \$18.75. New process—amount of anthracite coal consumed in annealing 180,000 shells = 600 pounds, as a cost of \$1.50. Old process—15 barrels of charcoal at 35 cents = \$5.25. A crane takes the retort from the furnace and deposits it upon a cradle, from which it is readily emptied. The retort with full charge, weighs about 600 pounds. The furnace has a hinged wrought-iron cover, which is lowered over the retort during the operation of annealing, and raised when the retort is removed, and a hinged flue, which fits into an opening in the cover connecting it with the draft. The accompanying drawing shows the general construction and operation of the furnace, which was designed by Mr. Jabez H. Gill, master machinist at Frankford Arsenal.

A RAILWAY TUNNEL THROUGH A VOLCANO.

The rocks which constitute the southern island of New Zealand are for the greatest part of the archaic type, consisting principally of gneiss, granite, mica-schist, phyllite, quartzite, and felsitic rocks. They are partly covered by palæozoic strata, which are folded up into innumerable troughs and saddle-backs throughout the province of Canterbury, and which partly belong to the carboniferous period, so that there are prospects for a future discovery of coal beds. By far the greatest interest, however, is offered by the extensive volcanic phenomena of the island, and among them, the extinct volcanoes upon the Banks peninsula, east of the town of Christchurch, are prominent. This peninsula, now only connected by bands of low and recent deposits with the mainland, was once a complete island, only formed by volcanoes, which rose up from the bottom of the sea. The special construction of such an extinct volcano has been made visible by a tunnel of 2,620 meters' length upon the railway between Christchurch and Littleton, which has pierced through the walls of a volcanic cone and thus has laid bare its structure of successive streams of lava and beds of scoriæ, ashes, and tuff, which are again intersected by dikes of younger volcanic rocks. This is perhaps the first volcano through which a railway has been constructed.

Another peculiarity of New Zealand is the extremely frequent occurrence of bones of those large wingless birds, which by the

aborigines were called "moa" and which belong to the family of the Dinornithidæ, of whom the largest representative, *Dinornis maximus*, has reached the considerable height of ten and a half feet; the largest deposits of these bones were found in the Point cavern and the marshes of Grenmark. There is now no doubt that these gigantic birds were contemporaneous with man, and that an early human race were moa hunters in these islands, who lived upon the flesh of these birds at a time when the glaciers extended still very much below their present boundaries, for bones, tools, and other remnants of these early moa hunters are frequently met intermingled with bones of the now extinct Dinornithidæ.

EGYPTIAN ANTIQUITIES.

Brugsch Pasha, the German Egyptologist, has communicated to the *Institut Egyptien* a memorandum which will have a double interest to all who care for Ancient Egypt. The following is an abridged translation:—

"Fifteen days before his death Mariette Pasha, the President of the Institute, summoned me to his bed-side, and begged me to render to him and to science a service of which he could not calculate the importance. Last year, after he had left for France, he had heard that his Arab labourers had opened one of the Sakkara pyramids. They had opened the north door and cleared the passage which led to the funeral chamber in the interior. Along the whole passage, 36 metres in length, the walls were covered with hieroglyphics, which constantly reproduced the names 'Merira' and 'Pepi' encircled by the Royal elliptic. Mariette, to whom were sent impressions of these hieroglyphics, believed they only applied to some high functionary of State, as neither of the names was preceded with the usual Royal titles of the Pharaohs. At the same time Mariette informed me that the Arabs had found the entrance of another pyramid near the first, with the passage and funeral chamber similarly adorned with numerous inscriptions. 'Go to-morrow,' he said, 'and study and report on these two pyramids.' I went next day early, and late in the evening presented the following report; his eyes glistened with joy as I read it:—

"The two funeral monuments are not mere *mastaba* (ordinary rock tombs), but true pyramids. They enclose, the one, the tomb of King Pepi with his official title, "Merira;" the other, the tomb of King Horemsaf, the son of Pepi, of the sixth dynasty, according to Manetho. The granite sarcophagi which once held the mummies of these two kings have been found in their original places. The hieroglyphics with which they are covered prove that the names of "Pepi" and "Horemsaf" belong to kings, and not to mere court functionaries. The mummy of the son of King Pepi, well preserved, though robbed of its ornaments and its linen, has been found in the pyramid. The two pyramids are the earliest examples of royal tombs of the period of the old Empire adorned with hieroglyphics, which not only give the names of the kings who are buried there, but which also set forth for the first time a long series of religious texts, like the "Book of the Dead" of subsequent epochs. They also mention the star "Sothis" (Sirius), the planet Venus, and thus prove a certain astronomical knowledge as long ago as the sixth dynasty. The passages and the funeral chambers, with the sarcophagi, the mummies, and the objects originally placed there, have been either very roughly handled or taken away altogether. The *stela* of Una in the Boulac Museum gives a confirmation of the contents of these two pyramids. Una was an official of King Pepi and his son, and executed many important works for them, of which he boasts on his *stela*. The numerous inscriptions cut in the stone and painted green are of the highest importance. They give an exact idea of the theological notions which obtained at this remote period, and at the same time throw new light on the dictionary, grammar and syntax, and generally on the language and writing of the most ancient known date of Pharaonic Egypt."

The following private letter which Brugsch Pasha received from Cairo will be read with interest in connection with this subject:—

"A good deal of interest has been excited by the rumours that two new pyramids have been discovered. As a pyramid is not of a nature to require discovery, and as in any case it was absurd to call any pyramid new, the French newspapers made fun of the rumour, the more so for a reason which does not appear on the surface. A discovery has, indeed, been made, and by a German, a near relative of the eminent historian Dr. Brugsch. He has been for some time engaged in researches at Sakkara, and recently dug out the two ruined pyramids marked,