

engines for steam navigation and locomotive purposes. The amount of coal used by ocean-going steamers during 1887 amounted to nearly 7,000,000 tons, and that consumed by the much larger number of steamers engaged in the coasting trade is estimated to have equalled that amount. The coal consumed by the locomotives on the railways in England in the same year is shown to have exceeded 6,000,000 tons.

Particular attention is drawn to the very rapid growth of the export of coal, which has increased from 4,333,333½ tons in 1854, to over 27,000,000 in 1888. The author considers it is but the measure of increased commercial prosperity, and that to impose any tax upon such exports would be like killing the goose that lays the golden eggs.

The author, in his concluding remarks, observes, that, if the growth of the trade and prosperity of England is to continue as it has done in the past, its coal-production, which is at once the cause and effect of this growth, must necessarily keep pace with it; and it is pointed out that unless large economies, which can and ought to be effected in its consumption, are realized, all the largest and best sources of the coal-supply will be exhausted in the very short periods mentioned in this paper. The hope is expressed, that, by drawing attention to this most vital subject, further strenuous efforts may be made to husband English coal resources in every possible way, and to put a stop to the great waste in working the mines, and in the consumption of coal generally.

MINING INDUSTRIES IN SIAM.

SIAM is rich in minerals. Gold, iron, tin, and copper are found in many parts of the country; but the want of roads, and consequent difficulty of getting these metals to market, prevent their being worked, except for the limited wants of the natives.

The English consul at Bangkok, Mr. Child, says, in his last report, an abstract of which appears in the *Journal of the Society of Arts* for Feb. 22, that the eastern part of Siam is very rich in iron, antimony, and argentiferous copper and tin. It is from the provinces of Petchaboon and Löm that the cutlasses, spears, and knives are furnished to all the provinces of the north and east. Silver is not found in Siam.

As regards gold, this metal is found in many places, but the mines at Bang Tapan on the west coast are said to contain the purest gold in the country. They have been worked by the natives by simply turning over the ground, the gold being found in the shape of nuggets. When nuggets over a certain size were found, the miners were obliged to hand them over to the government, but they were paid for the same according to a tariff fixed by the authorities.

A syndicate of foreigners has been formed, with a concession from the king, for working these mines, and has now a number of workmen employed, the prospects for rich developments being good.

The quartz-mines of Muang Krabin, although productive, were declared unprofitable to the government. Experienced engineers from Australia, mining machinery of recent invention, immense upright pumps and other hydraulic machinery, and a narrow-gauge railroad with rolling stock for the conveyance of the product, had been procured for the working of the mine; but, the organizer of the great scheme having been decapitated for alleged treason, the whole of the plant is lying idle.

The royal metal of Siam is mostly manufactured into vases, tea-pots, betel-boxes, and other articles, which it is the custom of the kings of Siam to present to subjects upon their elevation to high rank in the peerage of the kingdom. They are looked upon in a sense as insignia of their exalted rank, the shape and style of the set denoting the standing of the beneficiary.

It is impossible to procure statistics concerning the output of the mines. Iron of good quality is found in the eastern provinces, but it is worked in a very crude and primitive manner. Foundries are unknown. A hole or pit having been dug close to the mountain, the miner collects and piles up his ore, which he smelts with charcoal. The molten metal is deposited in a cavity prepared for its reception, and when cold the product is carried home.

There a fire is prepared, which is kept alive by a bellows made of two trunks of hollow trees buried in the ground, and having two long sticks as handles. A child works the bellows, while husband and wife or son hammer the iron into shape.

The knife, cutlass, spear, or agricultural implement produced by this combined labor finds a ready sale throughout the north of Siam, and, although the workmanship is poor, it suits the requirements of that section. The locality of the mines preclude shipments to Bangkok, as it would have to be conveyed to the river on elephants,—a method of conveyance too expensive for the commodity.

Tin is found in profusion in the Malayan peninsula, and is worked by Chinamen. It is generally exported direct to Singapore from the locality in which it is mined. Tin is also found in eastern Siam to a limited extent, but none of it finds its way to the capital.

Copper is found in certain localities, especially in the eastern provinces,—Champasak, Petchaboon, and Löm. In the former province, on the Makong River, there is a place where the natives procure the finest metal, of which they make a coin that passes current in that locality. It is about two inches in length, a quarter of an inch in breadth, and shaped like a canoe. The province adjoining that has an iron coin of the same shape, but larger in size. Virgin copper is held in great esteem by many for certain qualities it is supposed to possess when employed as an agent in transmuting metals. Without it as a basis, the native alchemists claim that gold cannot be obtained.

Coal is found on the coast and in the interior, but cannot be utilized. Limestone is brought to Bangkok from the interior. The lime is mixed with turmeric, and is used to a large extent by the Siamese in combination with the betel-nut and *seri* (pepper-leaf).

Precious stones come principally from the province of Chantibun; rubies, sapphires, topaz, asterias, and other stones being found in that district. The diamond is unknown as a native stone. The sapphire mines to the south of Chantibun, to which thousands of Burmese flocked a few years ago, have been exhausted.

BOOK-REVIEWS.

Popular Lectures and Addresses. By SIR WILLIAM THOMSON. In 3 vols. Vol. I. Constitution of Matter. London and New York, Macmillan. 12°. \$2.

THE author of this work possesses in an eminent degree the ability of putting into untechnical language those essentials of knowledge which are most interesting and attractive, and at the same time most useful, to the general reader. Among the contents of this volume may be mentioned "Capillary Attraction," which was originally delivered as a lecture before the Royal Institution in 1886; to which are added three appendixes treating of certain curious motions observable on the surfaces of wines and other alcoholic liquors, gravity and cohesion, and the equilibrium of vapor at a curved surface of liquid.

Shortly after the delivery of this lecture, it was suggested to Mr. Thomson that it might be advisable to make it more conveniently accessible to the general public than it could be in the "Transactions of the Royal Institution;" and it was accordingly arranged to bring out, as one of the Nature Series, a small volume containing the lecture mentioned, together with several other papers pertinent to the subject. While the volume was in course of preparation, it was decided to increase the size of it, adding several other lectures and addresses to the contents, and make it the first of a series of three volumes, constituting a reprint, in a revised form, of all Sir William's popular lectures and addresses. The result is the volume before us, the first volume of the series.

Besides the lecture already spoken of, a chapter each is devoted to the following subjects: "Electrical Units of Measurement," "The Sorting Demon of Maxwell," "Elasticity viewed as possibly a Mode of Motion," "The Size of Atoms," "Steps towards a Kinetic Theory of Matter," "The Six Gateways of Knowledge," "The Wave Theory of Light," "The Age of the Sun's Heat," and "Electrical Measurement." These were originally delivered as lectures and addresses before the Royal Institution, the Institution of Civil Engineers, the British Association, and the Franklin In-