

ART. XIII.—*Discovery of Emery in Chester, Massachusetts*; by
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It has been said, in England, that "a good mine of emery is worth more to a manufacturing people than many mines of gold." Such being the case, it affords me great pleasure to be able to announce the discovery of an inexhaustible bed of the best emery in the world in the middle of the State of Massachusetts, in Chester, Hampden county, quite near to the Western Railroad, which with its ramifications leads to the largest armories and manufactories of metallic articles in this and the adjacent States.

For more than two years, the existence of important beds of magnetic iron ore, originally discovered by Dr. H. S. Lucas, has been known, and endeavors were made by that gentleman to organize a company for the purpose of smelting these ores. In consequence of this agitation, I was employed by John B. Taft, Esq., on the 19th of August, 1863, to examine the locality and to make report of my results to him.

On examination of my specimens of minerals, after returning to Boston, and my notes for sectional profiles of the rocky strata containing the iron ore, I found that the minerals, margarite and chloritoid, in talcose, hornblende, and mica slate rocks, indicated the occurrence of emery, the association of the rocks and minerals being identical with conditions known to exist in the localities of emery in Asia Minor.

⁵ The following titles of literary works are also contained in the letter of Mr. Nicklès:

Histoire de la Littérature française, par M. Demogeot; 5th ed., 12mo, 680 pp.

Eléments de Rhétorique, par M. Filon; 12mo, 300 pp.

Les grandes scènes de la nature, par M. de Lanoye; 12mo.

Les Champs d'or de Bendigo (Australie), par M. Perron d'Arc; 12mo, 200 pp.

A description of the Australian placers.

Souvenirs d'un Sibérien, par Rufin Piotrowsky; 12mo, 200 pp. This is a very touching recital of the misfortunes which afflict the unhappy Poles, for whom Europe has only barren sympathy.

I therefore called the attention of the owners of the property to these facts, and directed search to be made for emery, and that every mineral resembling it should be sent to me for examination. Little attention was paid to this prediction at the time, and not until I had invited Dr. Lucas, who resides in Chester, by personal representations and solicitations, to make the required search, the characters of emery being fully described to him.

On his return to Chester he soon learned that the miners were complaining of the great hardness of the supposed iron ore, and that no less than forty drills were dulled in boring a single hole for blasting. He then sent me pieces of this hard rock, in the belief that it was the emery I had predicted. On examination it was found to scratch quartz and topaz readily, and to have all the properties of emery; a chemical analysis proved it to be identical with the emery of Naxos.

The owners, resident in Boston, being notified of this discovery, went with me to the locality on the 11th of October last, when a full exploration of the premises was made. There are several large beds of rich magnetic iron ore at this locality, and the emery being magnetic (as it always is) had caused it to be mistaken for magnetic iron ore, and many tons of it had been smelted with the carbonate of iron and hematite in the Berkshire county iron furnaces, without a suspicion, notwithstanding its refractory nature, that the ore was emery, with only a small admixture of iron ore.

The principal bed of emery is seen at the immediate base of the South Mountain, where it is four feet wide, and cuts through the mountain near its summit, at an angle of 70° inclination or dip to the eastward. Its course is N. 20° E., S. 20° W., and its known extent four miles. Near the summit of the mountain the bed expands to more than 10 feet in width, and in some places is even 17 feet wide.

The alternations of rock in two sections are as follows, beginning to the eastward:

1. *a*, Mica slate; *b*, 15 ft. soapstone or talcose rock; *c*, 2 feet crystallized talc; *d*, talcose slate; *e*, 1 ft. granular quartz; *f*, chlorite slate; *g*, 4 ft. *Emery*; *h*, chloritoid and margarite; *i*, magnetic iron ore; *j*, hornblende rock highly crystalline.

2. *a*, Mica slate; *b*, 6 ft. magnetic iron ore; *c*, talcose slate; *d*, $6\frac{1}{2}$ ft. magnetic iron ore; *e*, chlorite slate; *f*, hornblende rock, crystallized; *g*, 7 ft. *Emery*, chloritoid and margarite; *h*, magnetic iron ore; *i*, hornblende rock.

The elevation of the upper outcrop of this bed above the immediate base of the mountain is 750 feet. There are curious rounded masses of remarkably pure emery three feet in diameter in this bed entirely invested with a coat of delicate rose-colored margarite, and a thick layer of bright green chloritoid,

the investing coat being from half an inch to two inches in thickness. It is found extremely difficult to break up these masses of solid emery, drilling holes in them for blasting being very slow and laborious, and no grip can be had on their rounded sides by the sledge. A heavy drop hammer will be required to break them to pieces—or they may be cracked by fire if heat does not injure the emery.

A branch of Westfield river separates the South from the North mountain, a hill nearly 750 feet high, through the summit of which the great emery bed also cuts. On this hill the emery is more largely crystalline and less mixed with magnetic iron ore. It is more like corundum, but still contains the combined protoxyd of iron, characteristic of true emery. Its specific gravity is from 3·75 to 3·80, while that from the South mountain is from 4·02 to 4·37; Naxos emery being from 3·71 to 3·72, according to my trials of it, in comparison.

On the North mountain, three large beds of rich magnetic iron ore, distinct from the ore accompanying the emery, occur, the ore yielding $54\frac{1}{2}$ per cent of metallic iron. This ore is mined, and is smelted into bar iron by forge fires, and is also sold to mix with the hematites and carbonates of iron worked at the Lenox and Stockbridge furnaces.

Digesting the South mountain emery in fine powder with nitro-muriatic acid and sulphuric acid for a long time, it was found that 73 per cent of it was wholly insoluble in acids; and on microscopic examination the grains were seen to be translucent, and exactly like the Naxos emery prepared in the same way; but these translucent grains are readily taken up by the magnet. I therefore infer that protoxyd of iron is a chemical constituent of true emery.

Chemical analysis of the coarsely crystalline emery of the North Mountain, Chester. Sp. gr. 3·75. H.=9.

Alumina,	-	-	-	-	-	-	-	46·50
Protoxyd of iron,	-	-	-	-	-	-	-	44·00
Titanic acid,	-	-	-	-	-	-	-	5·00
Silica & loss,	-	-	-	-	-	-	-	4·50
								100·00

Emery of the South hill.* Sp. gr. 4·02. H.=9.

Alumina,	-	-	-	-	-	-	-	45·50
Protoxyd of iron,	-	-	-	-	-	-	-	43·00
Silica & titanic acid,	-	-	-	-	-	-	-	11·50
								100·00

Regarding the oxyd of iron which can be dissolved out from emery by acids as accidental, and that which cannot be so removed as an essential constituent, we shall have for the compo-

* The highest specific gravity of any sample from the South mountain was 4·3734.

sition of three samples of emery analysed, after digestion in acids,

	Chester, 1.	Chester, 2.	Naxos best selected emery.
Alumina,	60.4	59.05	62.3
Protoxyd iron,	39.6	40.95	37.7
	<u>100.0</u>	<u>100.00</u>	<u>100.0</u>

If this view is adopted, emery must be ranked as a distinct species, and not as a mere granular form of corundum or sapphire.

In conclusion, I would state that practical trials of the Chester emery, in several of the large armories and machine shops of this and the adjoining States, have proved it to be fully equal in value to the well known emery of Naxos, which I have no doubt it will wholly supplant in this country, and that it will ere long become an article of export to Europe, either in its native form, or in a manufactured state.

It may be proper to add, that John B. Taft, Esq., of Boston, in behalf of his associates, owners of the emery mine, has the sole management of the business connected with the mine.

I would express my obligations to Mr. J. L. Smith for the valuable information contained in his articles on the emery of Asia Minor and on the associated minerals of the emery localities, published in vols. x. and xi. of this Journal. Also to Dr. H. S. Lucas, of Chester, for kind assistance in the field.'

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