ABRASIVE MATERIALS.

By E. W. PARKER.

BUHRSTONES.

The value of buhrstones made from stone of domestic production in 1892 was $23,417, an increase of $6,830 over that of 1891, when the total value was $16,587. The producing States were New York, Pennsylvania, Virginia, and Vermont, the last named appearing for the first time as a producer of this article. Until 1892 the production of buhrstones has steadily declined, the output in 1891 being the smallest ever recorded, and although the production increased somewhat in 1892 it is not probable that it will continue to do so. The introduction of the roller process in flouring mills has practically shut out buhrstones, and the only demand at present is for grinding paints, cements, etc. The decline in the use of American stone has been accompanied by a similar falling off in the use of imported stones. As was the case in domestic production, the imports in 1891 were the lowest in several years; in fact, with one exception, the smallest on record. The general tendency of importations has been on the decrease since 1880, when the total value was $125,072, and since 1884 they have reached $40,000 in one year only—1889. They decreased both in 1890 and 1891, but show, like the domestic production, an increase in 1892.

The following table shows the value of buhrstones produced in the United States since 1883:

Value of buhrstones produced in the United States since 1883.

Years.	Value.	Years.	Value.
1883	$150,000	1888	$81,000
1884	150,000	1889	35,155
1885	100,000	1890	23,720
1886	140,000	1891	16,587
1887	100,000	1892	23,417

Value of buhrstones and millstones imported into the United States from 1868 to 1892.

Years ended—	Rough.	Made into millstones.	Total.	Years ended—	Rough.	Made into millstones.	Total.
June 30, 1868..	$74,224	.....	$74,224	June 30, 1881..	$100,417	$3,495	$103,912
1869..	57,942	$2,419	60,361	1882..	103,287	747	104,034
1870..	58,601	2,297	60,898	1883..	73,413	272	73,685
1871..	35,406	3,698	39,104	1884..	45,837	263	46,100
1872..	69,062	5,967	75,029	1885..	35,022	455	35,477
1873..	60,463	8,115	68,578	Dec. 31, 1886..	29,273	662	29,935
1874..	36,540	43,170	79,710	1887..	23,816	191	24,007
1875..	48,068	66,991	115,059	1888..	36,523	705	37,228
1876..	37,759	46,328	84,087	1889..	40,432	452	40,884
1877..	60,857	23,068	83,925	1890..	32,892	1,103	33,995
1878..	87,679	1,928	89,607	1891..	23,997	42	24,039
1879..	101,484	5,088	106,572	1892..	33,657	529	34,186
1880..	120,441	4,631	125,072				

GRINDSTONES.

The production of grindstones shows a decrease of over $200,000, the output in 1892 being valued at $272,244 against $476,113 in 1891. The product is all, practically, from Michigan and Ohio, though a small output is reported from California and South Dakota. The annual production since 1880 has been as follows:

Value of grindstones produced in the United States, 1880 to 1892, inclusive.

Years.	Value.	Years.	Value.
1880	$500,000	1887	$224,400
1881	500,000	1888	281,800
1882	700,000	1889	439,587
1883	600,000	1890	450,000
1884	570,000	1891	476,113
1885	500,000	1892	272,244
1886	250,000		

Grindstones imported and entered for consumption in the United States, 1868 to 1892, inclusive.

Years ended—	Finished.		Unfinished or rough.		Total value.
	Quantity.	Value.	Quantity.	Value.	
	Long tons.		*Long tons.*		
June 30, 1868	.....	$25,640	.....	$35,215	$60,855
1869	.....	15,878	.....	99,715	115,593
1870	.....	29,161	.....	96,444	125,605
1871	385	43,781	3,957.15	60,935	104,716
1872	1,202	13,453	10,774.80	100,494	113,947
1873	1,437	17,053	8,376.84	94,900	111,953
1874	1,443	18,485	7,721.44	87,525	106,010
1875	1,373	17,642	7,656.17	90,172	107,814
1876	1,681	20,262	6,079.34	69,927	90,189
1877	1,245	18,546	4,979.75	58,575	77,121
1878	1,463	21,688	3,969.41	46,441	68,129
1879	1,603	24,904	4,584.16	52,343	77,247
1880	1,573	24,375	4,378.59	51,899	76,274
1881	2,064	30,288	5,044.71	56,840	87,128
1882	1,705	30,286	5,945.61	66,939	97,225
1883	1,755	28,055	6,945.63	77,797	105,852
1884	.....	.....	.....	.....	*a* 86,286
1885	.....	.....	.....	.....	50,579
Dec. 31, 1886	.....	.....	.....	.....	39,149
1887	.....	.....	.....	.....	50,312
1888	.....	.....	.....	.....	51,755
1889	.....	.....	.....	.....	57,720
1890	.....	.....	.....	.....	45,115
1891	.....	.....	.....	.....	21,028
1892	.....	.....	.....	.....	61,052

a Since 1884 classed as finished or unfinished.

OILSTONES AND WHETSTONES.

There was very little change in the production of this class of abrasives in 1892 compared with 1891. The total value of the oilstones, whetstones, and scythestones produced in 1892 was $148,730. This includes, in addition to the production of the Pike Manufacturing Company at Pike Station, New Hampshire, the output, valued at $7,680, of a company in Ohio whose product is reported this year for the first time. The Pike Company estimates the value of its output in 1892 at $141,050. The bulk of the rough stone consists of two grades of novaculite known as Arkansas and Washita stone from Hot Springs, Arkansas, and Orange or Hindostan, stone from Orange county, Indiana, shipped to Pike Station, New Hampshire, or New York city (both factories being run by the one concern) for manufacture. The remainder of the product is made up of Labrador stone from Truxton, New York, chocolate stone from Lisbon, New Hampshire, Indian Pond and Lamoille scythestone, quarried at Haverhill and Piermont, Grafton county, New Hampshire, and in Orleans county, Vermont, and sandstone from Indiana, made into kitchen and shoemakers' rubstones. The quarries at Truxton, New York, were not worked in 1892, but there were 500 pounds of Labrador stone made and sold from material previously quarried.

The Pike Manufacturing Company reports its output in 1892 as follows:

Production of whetstones, etc., by the Pike Manufacturing Company.

	Output.	Value.
Washita stone.....pounds..	400,000	$60,000
Arkansas stone.....do....	20,000	12,000
Labrador stone.....do....	500	50
Hindostan stone.....do....	300,000	15,000
Sandstone.....do....	100,000	2,000
Chocolate stone.....do....	20,000	2,000
Scythestones.....gross..	16,000	50,000
Total.....	.....	141,050

Of the above sales the following is furnished as an estimate of the quantity exported and imported. It should also be stated that the foregoing, as well as the following, figures are not taken from the books, but are sufficiently correct to serve all practical purposes.

The exports were about:

Estimated exports of whetstones in 1892.

	Value.
Scythestones, 8,000 gross.....	$20,000
Washita stone, 150,000 pounds.....	20,000
Arkansas stone, 9,000 pounds.....	12,250
Hindostan stone, 75,000 pounds.....	2,250
Total.....	54,500

Estimated imports of whetstones in 1892.

	Value.
Turkey stone, 1,000 pounds	$200
Scotch stones (all kinds), 8,000 pounds	800
Razor hones, 1,000 dozen	2,000
English scythestones, 50 gross	300
Norway Ragg scythestones	None
German emery scythestones, 50,000	1,000
Total	4,300

The following table shows the total value of all kinds of hones and whetstones imported since 1880:

Imports of hones and whetstones for the years 1880 to 1892.

Years ended June 30—	Value.	Years ended December 31—	Value.
1880	$14,185	1887	$24,093
1881	16,631	1888	30,676
1882	27,882	1889	27,400
1883	30,178	1890	37,454
1884	26,513	1891	35,344
1885	21,434	1892	33,420
1886	21,141		

EMERY AND CORUNDUM.

Corundum and emery are distinguished from each other in that the former is oxide of aluminum alone, while the latter is an intimate mixture of oxide of aluminum with oxide of iron. Corundum is by far the more valuable mineral, being harder and of greater durability. Both minerals are used chiefly for the manufacture of abrasive wheels, the production of which is controlled by a few firms.

The product in 1892 consisted of 321 tons of corundum and 1,450 tons of emery, the total value of which was $181,300 more than double the value of the output in 1891.

The product is from Rabun county, Georgia; Macon and Jackson counties, North Carolina; Westchester county, New York; Chester county, Pennsylvania, and Hampden county, Massachusetts.

The following table shows the annual product of corundum and emery since 1881:

Annual product of corundum and emery since 1881.

Years.	Quantity.	Value.	Years.	Quantity.	Value.
	Short tons.			*Short tons.*	
1881	500	$80,000	1887	600	108,000
1882	500	80,000	1888	589	91,620
1883	550	100,000	1889	2,245	105,567
1884	600	108,000	1890	1,970	89,395
1885	600	108,000	1891	2,247	90,230
1886	645	116,190	1892	1,771	181,300

Emery imported into the United States from 1867 to 1892, inclusive.

Years ended—	Grains.		Ore or rock.		Pulverized or ground.		Other manufactures.	Total.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	Pounds.		*Tons.*		*Pounds.*			
June 30, 1867	.....	.....	428	$14,373	924,431	$38,131	.....	$52,504
1868	.....	.....	85	4,531	834,286	33,549	.....	38,080
1869	.....	.....	964	35,205	924,161	42,711	.....	77,916
1870	.....	.....	742	25,335	644,080	29,531	.....	54,866
1871	.....	.....	615	15,870	613,624	28,941	.....	44,811
1872	.....	.....	1,641	41,321	804,977	36,103	.....	77,424
1873	610,117	$29,706	755	26,065	343,828	15,041	$107	70,919
1874	331,580	16,216	1,281	43,886	69,890	2,167	97	62,366
1875	487,725	23,345	961	31,972	85,853	2,990	20	58,327
1876	385,246	18,999	1,395	40,027	77,382	2,533	94	61,653
1877	343,697	16,615	852	21,964	96,351	3,603	.....	42,182
1878	334,291	16,359	1,475	38,454	65,068	1,754	34	56,601
1879	496,633	24,456	2,478	58,065	133,556	4,985	.....	87,506
1880	411,340	20,066	3,400	76,481	223,855	9,202	145	105,894
1881	454,790	22,101	2,884	67,781	177,174	7,497	53	97,432
1882	520,214	25,314	2,765	69,432	117,008	3,708	241	98,695
1883	474,105	22,767	2,447	59,282	93,010	3,172	269	85,490
1884	143,267	5,802	4,145	121,719	513,161	21,181	188	148,890
1885	228,329	9,886	2,445	55,368	194,314	8,789	757	74,800
Dec. 31, 1886	161,297	6,910	3,782	88,925	365,947	24,952	851	121,638
1887	367,239	14,290	2,078	45,033	a144,380	6,796	2,090	68,209
1888	430,397	16,216	5,175	93,287	.....	.....	8,743	118,246
1889	503,347	18,937	5,234	88,727	.....	.....	111,302	218,966
1890	534,968	20,382	3,867	97,939	.....	.....	5,046	123,367
1891	90,658	3,729	2,530	67,573	.....	.....	.....	71,302
1892	566,448	22,586	5,280	95,625	.....	.....	2,412	120,623

a To June 30, only; since classed with grains.

INFUSORIAL EARTH.

The product consisted of 972 short tons of crude, 3,000 tons of refined, and 38,750 pounds manufactured into various cleansing preparations. The combined value was $43,655. The actual mining varies considerably in different years, some manufacturers producing enough crude earth in one year to last three or four years. In 1891 the production was light, the total value of the output in that year being $21,988. The supply in 1892 was obtained from Connecticut, Maryland, Nevada, New Hampshire, and New Jersey. The California properties were not worked.

The following table shows the annual production of infusorial earth since 1880:

Production of infusorial earth from 1880 to 1892.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1880	1,833	$45,660	1887	3,000	$15,000
1881	1,000	10,000	1888	1,500	7,500
1882	1,000	8,000	1889	3,466	23,372
1883	1,000	5,000	1890	2,532	50,240
1884	1,000	5,000	1891	.....	21,988
1885	1,000	5,000	1892	.....	43,655
1886	1,200	6,000			

TRIPOLI.

Through a very interesting and comprehensive exhibit at the World's Columbian Exposition, attention has been called to a valuable deposit of this material which occurs in Newton county, Missouri, and which has not received notice in previous volumes of "Mineral Resources."

The property was discovered about 1870, and partially opened in 1872, but the full value of the material was not then known, and it was not worked until 1887, when a steam plant was erected and new and improved machinery of special design was introduced for reducing the rock to a fine powder for mechanical purposes. Also for sawing, turning, and shaping the mineral in disks, cylinders, tubes, etc., for water filters. Even then the production was rather limited, and it was not until March, 1892, when the American Tripoli Company, of Carthage, Missouri, with a capital stock of $100,000, was incorporated, that work was actively pushed.

The mine is situated about 1 mile from the Saint Louis and San Francisco railroad at Seneca in Newton county, Missouri. The property consists of 283 acres. The deposit of tripoli is overlaid with about 4 feet of loose earth, and in thickness ranges from 10 to 20 feet, and is known to underlie from 80 to 100 acres. It is said to be the largest known deposit of its kind in the world.

The mineral is very compact, but sufficiently porous to make an excellent water filter. It is free from iron and coarse sand or grit, and ground for polishing purposes makes an exceedingly fine powder. The grain is sharp and cutting and yet fine enough not to scratch metal surfaces in polishing. The ground material is also used to a considerable extent in the manufacture of soaps.

Dr. Henry Froehling, of Richmond, Virginia, has made a partial examination, chemically and physically, of the mineral, but has not yet definitely ascertained what it is. He is convinced that it is not properly infusorial earth, and thinks it is probably a species of decomposed quartz.

The output from the mine in 1892 was nearly 2,000,000 pounds, or 1,000 short tons, of powdered material, and between 15,000 and 20,000 finished pieces of filter goods, the total value of which is estimated at about $30,000.

RECENT INVENTIONS.

Carborundum.—This material is the invention of Mr. E. G. Acheson, of Monongahela City, Pennsylvania. It is a chemical combination of carbon and silicon, or, in other words, a carbide of silicon. It is the result of a series of experiments conducted by Mr. Acheson in the hope of securing a substitute for the diamond as an abrasive. It is essentially a manufactured product and as such does not properly belong in an article devoted to the discussion of natural abrasives, but on account of its future bearing on the industry and the interest developed in the invention by the exhibit of the material at the World's Columbian Exposition a brief notice may not be out of place. It is produced by passing an electric current through an intimate mixture of crushed coke and sand, the current being sufficiently high and kept up long enough to fuse the mass and effect the combination.

The product is a porous cinder-like mass of iridescent crystals, the principal color being about sapphire blue. The mass is first cleansed by washing with water and is then treated with acids to remove soluble impurities. After this it is dried and crushed. The crushing breaks apart the individual crystals which are then assorted into various sizes by a system of floating. This "floating" is accomplished by a series of tanks through which the water holding the carborundum in suspension flows in a continuous stream.

The first use to which the product was put was as a polishing material in lapidary work, but its field of usefulness has been recently enlarged by the manufacture of hones, wheels, and other forms in which abrasives are used. The crystals are mixed with clay or other suitable cementing material and molded into the desired shapes, the percentage of bonding material varying according to the work to be done. The articles manufactured from carborundum were exhibited in the Mining Building at the Columbian Exposition and their merits demonstrated by practical tests. In addition to the ordinary abrasive wheels and hones, small discs and points for dental work are made from carborundum and have been received with great favor.

Carborundum has also been made into buttons, and used (as yet experimentally) for electric lighting. Its future use in this way is at present a matter of uncertainty and conjecture, but enough has been done to show the advisability of further investigation. The experiments in this line have been conducted by Mr. Nikola Testa, and the results were exhibited by him before the Institution of Electrical Engineers in London, February 1892. In fact, the invention or discovery of carborundum has opened a field of investigation, the development of which will be watched with a great deal of interest.

Crushed steel.—Another recent invention in the line of abrasives, to which attention has been called by an interesting exhibit at the Columbian Exposition, is "crushed steel" manufactured by the Pittsburg Crushed Steel Company, limited, of Pittsburg, Pennsylvania. This product is obtained from crucible steel, highly carbonized and made crystalline in structure by manipulation in furnaces and chemical bath treatment. It is then reduced to small crystals by crushing under heavy machinery, after which it is assorted into sizes by a system of sieves. The larger sizes, which vary from about the size of a No. 2 bird shot to 1-40 of an inch, are classed as crushed steel proper, and used for sawing stone, particularly those varieties possessing hard and gritty qualities, such as granite, sandstone, marble etc. Grains which pass through sieves ranging from 40 to 150 meshes to the inch are classed as "steel emery," and used upon rubbing beds and for polishing purposes. The finest product is, by an oxidizing process, manufactured into putty powder and rouge for polishing marbles, granites, agate, and glass.

The crystals of crushed steel and steel emery present sharp cutting edges, having about the same angles as quartz when crushed. They are exceedingly hard and are more effective under the saw blades and on the rubbing bed than sand. The effectiveness of crushed steel and steel emery is due to the fact that the crystals do not wear away and become smooth. A grain of crushed steel under the microscope presents a series of crystals, and if sufficient force be applied they are detached, but maintain their crystalline form and abrasive qualities. For this reason the material can be used a great number of times, and in order to effect the greatest economy in its use, the manufacturers of crushed steel have also invented automatic attachments for saw gangs and rubbing beds by which the steel once used is saved and returned. The efficacy of these products—crushed steel, steel emery, and the putty powder and rouge—has been attested by stone workers and manufacturers of lenses.