

## ABRASIVE MATERIALS.

BY EDWARD W. PARKER.

### BUHRSTONES.

Buhrstones, or millstones, are made from a quartz conglomerate rock occurring along the eastern slope of the Alleghany Mountains in New York, Pennsylvania, and North Carolina. It is known locally by various names. In Ulster County, N. Y., it is called "Esopus stone;" in Lancaster County, Pa., it is known as "cocalico stone;" in Montgomery County, Va., it is quarried as "Brush Mountain stone," and in Moore County, N. C., it goes by the name of "North Carolina grit." The industry has been on the decline for a number of years, the introduction of the roller process in flouring mills having cut off the chief market for buhrstones. Their use now is practically confined to the grinding of paint and cement rock. In remote regions of the Appalachian range, particularly in the Southern States, owners of mills which grind corn for the neighboring mountaineers use stones made from rock quarried in the vicinity. They usually work up the stones themselves, and there is no way of obtaining either the amount or value of the product. This small factor is not considered in the statistics of production.

Although classed as buhrstone, the domestic material is entirely distinct from any of the buhrs which are imported from France, Belgium, and Germany. The French buhr is considered the best. Both it and the Belgian buhr consist of small particles of silica mixed with calcareous material, and are hard and porous. The German buhr is said to be of basaltic lava. The domestic stone is a quartz conglomerate. All of the foreign stone is quarried in small pieces, which are shipped in the rough state at cheap freight rates to this country where they are dressed to conformable shapes, fitted together, and bound into solid wheels. The domestic stone is found in large bowlders, which are worked down to millstones of the required size, the chief advantage for these being in the fact that they are in one piece. The domestic stone is of much coarser grain than the foreign and is not suitable for grind-

ing wheat, its use being limited to the coarser cereals, paints, cements, fertilizers, etc. During the past few years a new millstone made of emery ore, ground and cemented into solid wheels, has been introduced. It is said to be superior to any of the others, and has certainly been favorably received. The continued decrease in production indicates that the emery-rock millstones have superseded the domestic buhrstones to some extent already.

PRODUCTION.

The value of buhrstones of domestic production in 1894 was only \$13,887, the smallest on record, and less than 10 per cent of the value of the product in 1884, ten years previous. The product was from New York, Pennsylvania, and Virginia. In the following table is exhibited the value of the millstones produced in the United States since 1880:

Value of buhrstones produced in the United States from 1880 to 1894.

Years.	Value.	Years.	Value.
1880 .....	\$200,000	1888 .....	\$81,000
1881 .....	150,000	1889 .....	35,155
1882 .....	200,000	1890 .....	23,720
1883 .....	150,000	1891 .....	16,587
1884 .....	150,000	1892 .....	23,417
1885 .....	100,000	1893 .....	16,639
1886 .....	140,000	1894 .....	13,887
1887 .....	100,000		

IMPORTS.

Value of buhrstones and millstones imported into the United States from 1868 to 1894.

Years ended—	Rough.	Made into millstones.	Total.	Year ended—	Rough.	Made into millstones.	Total.
June 30, 1868..	\$74,224	.....	\$74,224	June 30, 1882..	\$103,287	\$747	\$104,034
1869..	57,042	\$2,419	60,361	1883..	73,413	272	73,685
1870..	58,001	2,297	60,898	1884..	45,837	263	46,100
1871..	35,406	3,608	39,104	1885..	35,022	455	35,477
1872..	69,062	5,967	75,029	Dec. 31, 1886..	29,273	662	29,935
1873..	60,463	8,115	68,578	1887..	23,816	191	24,007
1874..	36,540	43,170	79,710	1888..	36,523	705	37,228
1875..	48,063	66,901	115,059	1889..	40,432	452	40,884
1876..	37,759	46,328	84,087	1890..	32,892	1,103	33,995
1877..	60,857	23,068	83,925	1891..	23,997	42	24,039
1878..	87,679	1,928	89,607	1892..	33,657	529	34,186
1879..	101,484	5,088	106,572	1893..	29,532	729	30,261
1880..	120,441	4,631	125,072	1894..	.....	.....	\$13,887
1881..	100,417	3,495	103,912				

<sup>a</sup> Not separately classified after 1893.

GRINDSTONES.

The total value of grindstones produced in the United States in 1894 was \$223,214, against \$338,787 in 1893, a decrease of \$115,573, or a little more than 33 per cent. The decrease is attributed to the trade depression and the general decline in values.

The production of grindstones is limited to Ohio and Michigan. The following table shows the value of grindstones produced annually in the United States since 1880:

*Value of grindstones produced in the United States, 1880 to 1894.*

Years.	Value.	Years.	Value.
1880 .....	\$500,000	1888 .....	\$281,800
1881 .....	500,000	1889 .....	439,587
1882 .....	700,000	1890 .....	450,000
1883 .....	600,000	1891 .....	476,113
1884 .....	570,000	1892 .....	272,244
1885 .....	500,000	1893 .....	338,787
1886 .....	250,000	1894 .....	223,214
1887 .....	224,400		

*Grindstones imported and entered for consumption in the United States, 1868 to 1894, inclusive.*

Years ended—	Finished.		Unfinished or rough.		Total value.
	Quantity.	Value.	Quantity.	Value.	
	<i>Long tons.</i>		<i>Long tons.</i>		
June 30, 1868 .....		\$25,640		\$35,215	\$60,855
1869 .....		15,873		99,715	115,588
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	17,033	8,376.84	94,900	111,933
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	21,088	3,669.41	46,441	68,129
1879 .....	1,603	24,904	4,584.16	52,343	77,247
1880 .....	1,573	24,375	4,578.59	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 .....					<sup>a</sup> 86,286
1885 .....					50,579
Dec. 31, 1886 .....					39,149
1887 .....					50,312
1888 .....					51,735
1889 .....					57,720
1890 .....					45,115
1891 .....					21,028
1892 .....					61,052
1893 .....					59,569
1894 .....					52,688

<sup>a</sup> Since 1884 classed as finished or unfinished.

## OILSTONES AND WHETSTONES.

### PRODUCTION.

The production of oilstones, whetstones, etc., in 1894, was about the same as that of 1893, being valued at \$136,873, against \$135,173, the difference being but little more than 1 per cent. Included in this production are the two grades of novaculite from Arkansas, known respectively as "Arkansas" and "Washita" stone; the fine-grained sandstone of Orange County, Ind., known as "Hindustan" or "Orange" stone; Lake Superior stone, a gray sandstone quarried in Cuyahoga County, Ohio; Labrador stone, similar to the Lake Superior article, from Cort-

land County, N. Y., and chocolate stone from Lisbon, N. H. It also includes scythestones, made from Indian Pond and Lamoille sandstone, quarried in Grafton County, N. H., and Orleans County, Vt., and from Berea "grit," quarried at Berea, Ohio.<sup>1</sup>

The production of finished oilstones, etc., in the United States is practically controlled by one firm—the Pike Manufacturing Company, of Pike Station, N. H. The contracts with other firms, mentioned in Mineral Resources for 1893 as having been dissolved, were renewed during 1894, the principal competitive concerns agreeing to close down for a series of years. In addition to the Pike company's output a comparatively small number of whetstones were made in New York and Ohio by other firms, and another firm in Michigan was engaged in the manufacture of scythestones.

The reports of production by the Pike Manufacturing Company, which have been furnished this office for publication, may be taken as indicative of the condition of the industry. This company owns quarries in Haverhill, Piermont, Orford, and Lisbon, N. H.; Westmore and Brownington, Vt.; Cummington, Mass.; French Lick, Ga., and Orangeville and Paoli, Ind., and about 1,000 acres of quarry land in Garland County, Ark., thus covering the entire field.

The following tables show the production, exports, and imports of oilstones, etc., by the Pike Manufacturing Company for three years:

*Production of oilstones, etc., by the Pike Manufacturing Company in 1892, 1893, and 1894.*

Kinds.	1892.		1893.		1894.	
	Output.	Value.	Output.	Value.	Output.	Value.
Washita stone ..... pounds..	400,000	\$60,000	300,000	\$45,000	300,000	\$45,000
Arkansas stone ..... do....	20,000	12,000	12,000	12,000	15,000	15,000
Labrador stone ..... do....	500	50	200	20	100	10
Hindustan stone ..... do....	300,000	15,000	250,000	13,000	300,000	15,000
Sandstone ..... do....	100,000	2,000	100,000	2,000	100,000	2,200
Chocolate stone ..... do....	20,000	2,000	20,000	2,000	25,000	2,500
Scythestones ..... gross..	16,000	50,000	13,000	40,000	15,000	45,000
Total value .....		141,050		114,020		124,710

*Estimated exports of oilstones, etc., in 1892, 1893, and 1894.*

Kinds.	1892.		1893.		1894.	
	Amount.	Value.	Amount.	Value.	Amount.	Value.
Scythestones ..... gross..	8,000	\$20,000	8,000	\$19,000	9,000	\$20,000
Washita stone ..... pounds..	150,000	20,000	180,000	21,000	200,000	30,000
Arkansas stone ..... do....	9,000	12,250	8,000	10,500	8,000	10,000
Hindustan stone ..... do....	75,000	2,250	100,000	3,500	150,000	7,000
Sandstone ..... do....			50,000	1,000	40,000	800
Total value .....		54,500		55,000		67,800

<sup>1</sup> See paper on Berea grit, by M. C. Read, Mineral Resources, 1882, p. 478.

*Estimated imports of oilstones, etc., in 1892, 1893, and 1894.*

Kinds.	1892.		1893.		1894.	
	Amount.	Value.	Amount.	Value.	Amount.	Value.
Turkey stone.....pounds..	1,000	\$200	1,000	\$200	2,000	\$400
Scotch stones (all kinds)...do....	8,000	800	4,000	400	3,000	300
Razor hones.....dozen..	1,000	2,000	1,000	1,500	2,000	5,000
English scythestones ....gross..	50	300	25	150	100	600
Norway Ragg scythestones.....		None.		None.		None.
German emery scythestones.....	50,000	1,000	30,000	500	30,000	450
Naxos emery scythestones.....					5,000	200
Total value.....		4,300		2,750		6,950

#### IMPORTS.

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

*Imports of hones and whetstones since 1880.*

Years ended—	Value.	Years ended—	Value.
June 30, 1880 .....	\$14,185	Dec. 31, 1888.....	\$30,676
1881 .....	16,631	1889.....	27,400
1882 .....	27,882	1890.....	37,454
1883 .....	30,178	1891.....	35,344
1884 .....	26,513	1892.....	33,420
1885 .....	21,434	1893.....	25,301
Dec. 31, 1886 .....	21,141	1894.....	26,671
1887 .....	24,953		

#### CORUNDUM AND EMERY.

##### PRODUCTION.

The total amount of corundum produced in 1894 was 945 short tons and that of emery 550 tons, an aggregate of 1,495 short tons, the combined value of which was \$95,936. This was the smallest product since 1888, but the value, while less than that of either 1892 or 1893, was more than that of 1890 or 1891, when the product was considerably more. The corundum output was, as in 1893, from Rabun County, Ga., Macon and Jackson counties, N. C., and Hampden County, Mass. No corundum was mined in Chester County, Pa., in either 1893 or 1894. The production and use of Westchester County, N. Y., emery is increasing, and the material is growing in favor for the manufacture of emery wheels, etc., in competition with Turkish and Naxos emery. Five years ago the shipments of emery from Westchester County did not exceed 30 tons. In 1894 the shipments were over 500 tons. Most of the product is shipped in crude form for manufacture at other points, some going by rail and some by boat from Peekskill. The decreased production of corundum in 1894 was caused by the closing down, temporarily, of some mines in North Carolina, the suspension being partly due to unfavorable trade conditions, and partly to bad weather, which had rendered the mountain roads impassable for wagons during a good part of the time.

The distribution of deposits of emery and corundum throughout the United States has been discussed at length in previous volumes of Mineral Resources.<sup>1</sup> A number of writers have contributed to the literature bearing upon the relative merits of corundum and emery as abrasives, but unfortunately they have been, as a usual thing, identified with one or the other interest, and their opinions are necessarily somewhat prejudiced. Mr. T. Dunkin Paret, of the Tanite Company, Stroudsburg, Pa., in papers on emery wheels and on emery and other abrasives, read before the Franklin Institute<sup>2</sup> of Philadelphia, has ably presented the cause of emery, while Mr. Charles N. Jenks, of the Sapphire Valley Corundum Company, of Sapphire, N. C., in the Scientific American Supplement, December 8, 1894, presents equally strong arguments in favor of corundum.

The introduction of rock emery into the manufacture of millstones, supplanting French and other buhrs, is of interest. They are said to run easier per ton of output than any other grinders, and to require less attention. They possess a greater hardness than any other grinding material, and do not require dressing or sharpening. Some of the supporters of millstones made from rock emery are predicting the supplanting by them of the roller process in flouring mills.

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.
	<i>Short tons.</i>			<i>Short tons.</i>	
1881.....	500	\$80,000	1888.....	589	\$91,620
1882.....	500	80,000	1889.....	2,245	105,567
1883.....	550	100,000	1890.....	1,970	89,395
1884.....	600	108,000	1891.....	2,247	90,230
1885.....	600	108,000	1892.....	1,771	161,300
1886.....	645	116,190	1893.....	1,713	142,325
1887.....	600	108,000	1894.....	1,495	95,936

<sup>1</sup> See Mineral Resources, 1882, p. 476; 1883-84, p. 714; 1893, p. 674.

<sup>2</sup> Journal of the Franklin Institute, March, 1890, and May and June, 1894.