

ABRASIVE MATERIALS.

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INTRODUCTION.

Under the subject of abrasive materials are included all the natural products that are used for abrasive purposes. They are treated under the following heads: Oilstones and whetstones, grindstones, pulpstones, buhrstones or millstones, infusorial earth and tripoli, pumicestone, crystalline quartz, garnet, and corundum and emery. Besides these natural products, the artificial products, carborundum and crushed steel, are briefly considered.

It will be seen in examining the following pages, that while the production of certain of the abrasives is on the decline, that of others is increasing, and that the aggregate amount of abrasive materials used is greater than ever before. This, of course, is the natural outcome of the increase in our manufacturing industries. There could readily be an overproduction of most of the abrasives, as the market is a decidedly limited one; but there will be an increasing demand for them from year to year, although new natural or artificial products may now and then be discovered that will replace those now in use. Thus carborundum has replaced other abrasives that were formerly used in certain cases before it was manufactured. It can not now be stated to what extent the natural abrasives will be replaced by the artificial, and no appreciable change may be observed for some years to come. The more noticeable change is and will be among the natural abrasives themselves.

The total value of all the natural abrasives produced in the United States during 1900 was \$1,207,073, as compared with \$1,225,211 for 1899.

In the following table is given a list of the values of the production of each of the different abrasives in the United States for the years 1899 and 1900:

Summary of value of product of abrasives in the United States during 1899 and 1900.

Kind of abrasive.	Value.		Kind of abrasive.	Value.	
	1899.	1900.		1899.	1900.
Oilstones, whetstones, etc...	\$208,283	\$174,087	Corundum and emery	\$150,600	\$102,715
Grindstones	675,586	710,026	Total	1,225,211	1,207,073
Buhrstones	28,115	32,858	Artificial abrasives:		
Infusorial earth	25,302	<i>a</i> 24,207	Carborundum.....	139,299	(<i>b</i>)
Crystalline quartz.....	39,000	40,705	Crushed steel	47,250	50,000
Garnet	98,325	123,475			

a Includes tripoli.

b Quantity, 2,401,000 pounds; value not given.

OILSTONES, WHETSTONES, ETC.

PRODUCTION.

The production of oilstones and whetstones in the United States has been constantly increasing during the last few years, due partly to the hold that American stones have obtained in foreign markets. The year of maximum production was 1899, when the value of the output amounted to \$208,283.

Value of oilstones, whetstones, etc., produced in the United States since 1891.

Year.	Value.	Year.	Value.
1891	\$150,000	1896	\$127,098
1892	146,730	1897	149,970
1893	135,173	1898	180,486
1894	136,873	1899	208,283
1895	155,881	1900	174,087

IMPORTS.

The oilstones and whetstones that are imported into the United States differ materially from those that are exported, and consist principally of Belgian razor hones, that are made from a slaty mica-schist, found in the Ardenne Mountains of Belgium; razor hones made from a fine hard blue-green slaty mica-schist from Sonneberg, Germany, and a small quantity of Turkey oilstones from France and Italy.

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

Value of imports of hones and whetstones since 1880.

Year ending—	Value.	Year ending—	Value.
June 30—		December 31—	
1880	\$14,185	1890	\$37,454
1881	16,631	1891	35,344
1882	27,882	1892	33,420
1883	30,178	1893	25,301
1884	26,513	1894	26,671
1885	21,434	1895	32,439
December 31—		1896	50,588
1886	21,141	1897	34,485
1887	24,093	1898	30,856
1888	30,676	1899	34,510
1889	27,400	1900	39,306

The exports of oilstones, scythestones, etc., are much in excess of the imports, and consist principally of New Hampshire scythestones, which are shipped into nearly all foreign countries, but find their largest market in European countries. There is also a considerable exportation of Arkansas and Indiana oilstones. Thus it is seen that our imports consist for the most part of razor hones and our exports of oilstones and scythestones.

GRINDSTONES.

PULPSTONES.

Since paper began to be manufactured from woodpulp there has been a demand for a stone suited to the grinding of wood to a pulp. The main supply of pulpstones has been imported from Newcastle-upon-Tyne, England. This stone has always been considered of better quality for this kind of grinding than any of the American stones. The grinding of pulp requires a stone that can be run in hot water, which is used in its manufacture. By careful attention to the selection of the grit and the details of quarrying and manufacturing, a good pulpstone should be produced from the Peninsula and Tippecanoe grits of the Ohio sandstones. The Cleveland Stone Company is making a special effort to produce a pulpstone from a particular grit at Peninsula, Ohio, that will thoroughly satisfy the pulp manufacturers. The Haldeman Stone Company, which opened a new quarry at Tippecanoe, Ohio, in the latter part of 1898, has found a grit (the Tippecanoe) that is well adapted to the manufacture of pulpstones, and it is claimed that 20 to 25 feet of the upper portion of the sandstone can be used in this manufacture.

Pulpstones differ from grindstones in having a much broader face (being much thicker). The stones are usually from 48 to 56 inches in diameter and 16 to 26 inches in thickness, weighing from 2,300 to 4,800 pounds.

The production of pulpstones in 1900 was 553 tons, valued at \$12,495, as compared with 288 tons, valued at \$8,712, produced in 1899, and 296 tons, valued at \$10,619, in 1898. While there has been a large increase in the tonnage of pulpstones produced in 1900, the value has decreased from \$36 in 1898 to \$30 in 1899 and to \$26 per ton in 1900. This increase in the production during 1900 is due to the more thorough introduction of the Peninsula and Tippecanoe stones in the trade. The outlook for 1901 is for a greater production even than that for 1900.

PRODUCTION.

The high-water mark in the grindstone industry was reached in 1900, when the value of the product amounted to \$710,026. This was nearly equaled in 1882, when it was \$700,000. The output in 1900 showed an increase of \$34,440 over that of 1899, when it amounted to \$675,586. This in turn was an increase of \$185,817 over that of 1898. Although

the value of the production in 1882 was so high, the tonnage was considerably larger both in 1900 and 1899, for in 1882 the price was \$15 per ton at the quarry, while in the latter year it had declined to almost \$9 per ton. This marked increase in the production of grindstones during the last two years is probably due to the great increase in all kinds of manufacturing.

In making their reports of production to the Survey some manufacturers use the ton as the unit of measurement, while others state the number of grindstones made and sold, and it was not until 1898 that any separation of quantity was attempted. In 1900 the manufacturers who stated the number of grindstones sold reported a product aggregating 6,085 pieces, valued at \$81,722, as compared with 6,300 pieces, valued at \$69,776, in 1899. The product reported by weight amounted to 46,406 tons, valued at \$619,399, in 1900, against 50,644 tons, valued at \$605,810, in 1899.

In the following table is shown the value of grindstones, including pulpstones, produced in the United States since 1880:

Value of grindstones produced in the United States since 1880.

Year.	Value.	Year.	Value.
1880.....	\$500,000	1891.....	\$476,113
1881.....	500,000	1892.....	272,244
1882.....	700,000	1893.....	338,787
1883.....	600,000	1894.....	223,214
1884.....	570,000	1895.....	205,768
1885.....	500,000	1896.....	326,826
1886.....	250,000	1897.....	368,058
1887.....	224,400	1898.....	489,769
1888.....	281,800	1899.....	675,586
1889.....	439,587	1900.....	710,026
1890.....	450,000		

The decided increase in the production of grindstones is partly due to the large number of agricultural machines manufactured, which call for a corresponding increase in the number of grindstones, and which has caused a less demand for scythestones.

IMPORTS.

The ratio of the imports of grindstones to the domestic production had been decreasing materially during the last few years prior to 1900, but in that year the imports gained considerably more, proportionately, than the product. The imports are kept up largely by the demand of the large pulp manufacturers for the Newcastle pulpstones, which are obtained from Newcastle-upon-Tyne, in England. Other imported grindstones are a coarse, hard one from Bavaria, which is used for razor grinding, and a very hard one from Edinburgh, Scotland, called the Craigleigh, that is used for special purposes in the glass trade. In reporting the imports of grindstones the Bureau of

Statistics of the Treasury Department limits the statements to the value, no figures relating to the quantity having been published since 1883.

The amount and value of the grindstones imported into the United States since 1868 are given below:

Grindstones imported and entered for consumption in the United States, 1868 to 1900, inclusive.

Year ending—	Finished.		Unfinished or rough.		Total value.
	Quantity.	Value.	Quantity.	Value.	
June 30—	<i>Long tons.</i>		<i>Long tons.</i>		
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	17,033	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	21,688	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.....					^a 86,286
1885.....					50,579
December 31—					
1886.....					39,149
1887.....					50,312
1888.....					51,755
1889.....					57,720
1890.....					45,115
1891.....					21,028
1892.....					61,052
1893.....					59,569
1894.....					52,688
1895.....					54,276
1896.....					66,195
1897.....					49,496
1898.....					62,973
1899.....					63,852
1900.....					92,581

^a Since 1884 classed as finished or unfinished.

Grindstones have begun to be exported in considerable numbers, so that now the total of the exports is greater than that of the imports.

BUHRSTONES, OR MILLSTONES.

Many varieties of stone are classed as buhrstone, or millstone, on account of their being used for the same purposes as the regular buhr. The American stone varies from a sandstone to a quartz-conglomerate rock, which occurs along the eastern slopes of the Appalachian Moun-

tains from New York to North Carolina. It is known locally by different names, that from Ulster County, N. Y., being called "Esopus stone," that from Lancaster County, Pa., being known as "cocalico stone," and that from Montgomery County, Va., going by the name of "Brush Mountain stone." These are the only places where it was quarried during 1900. It was formerly obtained from Moore County, N. C., and was known by the name of "North Carolina grit." A buhrstone, or millstone, was also formerly obtained from the Berea grit (sandstone) at Peninsula, Ohio. In the isolated mountain districts, especially of the Southern States, there are a great variety of stones used as buhrstones, for any solid quartz rock will answer the purpose to a certain extent. The owners of many of these small mills, who grind wheat and corn for the neighboring mountaineers, quarry the stone in their vicinity and work it up themselves. Since scrap mica became of value as a ground or flour product a number of mills have been erected in the mica regions that use buhrstones for grinding the mica, some of which are quarried locally.

The buhrstones imported from France, Belgium, and Germany are of a decidedly different character and better than the American stone. The French buhr is considered the best, and both it and the Belgian are hard and porous rocks, consisting of small particles of quartz mixed with calcareous material. The German buhr is said to be a basaltic lava. These foreign stones are usually brought into this country in pieces and then made up into the buhrstone, thus escaping the higher duty of a finished product.

The use of buhrstones for making wheat flour has practically ceased since the introduction of the roller process. It is only in certain of the mountain districts where railroad facilities are wanting that buhrstones are still used for this purpose. They are now used for grinding the coarser cereals, mineral-paint ores, fertilizers, cement rock, and other minerals, but this is a comparatively limited trade. For these latter uses the American stones seem to be as satisfactory as the foreign.

PRODUCTION.

What was a flourishing industry twenty years ago is now hardly worthy of that name. Where in 1880 there were \$200,000 worth of buhrstones produced in the United States and \$125,072 worth imported, in 1900 the value of the buhrstones produced was only \$32,858 and of those imported only \$28,904. The sharp decline or break in the production was in 1889, and for the past eleven years the average production has been about \$22,500. The importation of buhrstones began to decline sharply in 1883, and there has been a gradual falling off since then.

The reasons for this general decline were natural and have already been referred to. In 1899 there was an increase in the production over

that of 1898, and a still further increase in 1900, the production being valued at \$32,858, as compared with \$28,115 in 1899 and \$25,934 in 1898.

The production since 1880 is given in the following table:

Value of buhrstones produced in the United States from 1880 to 1900.

Year.	Value.	Year.	Value.
1880.....	\$200,000	1891.....	\$16,587
1881.....	150,000	1892.....	23,417
1882.....	200,000	1893.....	16,639
1883.....	150,000	1894.....	13,887
1884.....	150,000	1895.....	22,542
1885.....	100,000	1896.....	22,567
1886.....	140,000	1897.....	25,932
1887.....	100,000	1898.....	25,934
1888.....	81,000	1899.....	28,115
1889.....	35,155	1900.....	32,858
1890.....	23,720		

IMPORTS.

The importation of buhrstones and millstones has continued to grow smaller, not only on account of the introduction of the roller process for making wheat flour, but because the buhrstones produced in this country are as satisfactory as the foreign ones for the purposes for which these stones are now used.

In the following table the value of buhrstones and millstones imported into the United States since 1868 is given:

Value of buhrstones and millstones imported into the United States from 1868 to 1900.

Year ending—	Rough.	Made into millstones.	Total.	Year ending—	Rough.	Made into millstones.	Total.
June 30—				June 30—			
1868.....	\$74,224	.....	\$74,224	1885.....	\$35,022	\$455	\$35,477
1869.....	57,942	\$2,419	60,361	December 31—			
1870.....	58,601	2,297	60,898	1886.....	29,273	662	29,935
1871.....	35,406	3,698	39,104	1887.....	23,816	191	24,007
1872.....	69,062	5,967	75,029	1888.....	36,523	705	37,228
1873.....	60,463	8,115	68,578	1889.....	40,432	452	40,884
1874.....	36,540	43,170	79,710	1890.....	32,892	1,103	33,995
1875.....	48,068	66,991	115,059	1891.....	23,997	42	24,039
1876.....	37,759	46,328	84,087	1892.....	33,657	529	34,186
1877.....	60,857	23,068	83,925	1893.....	29,532	729	30,261
1878.....	87,679	1,928	89,607	1894.....	.....	.....	^a 18,087
1879.....	101,484	5,088	106,572	1895.....	.....	.....	20,316
1880.....	120,441	4,631	125,072	1896.....	.....	.....	26,965
1881.....	100,417	3,495	103,912	1897.....	.....	.....	22,956
1882.....	103,287	747	104,034	1898.....	.....	.....	22,974
1883.....	73,413	272	73,685	1899.....	.....	.....	18,881
1884.....	45,837	263	46,100	1900.....	.....	.....	28,904

^a Not separately classified after 1893.